A PHASE ONE GEOTECHNICAL REPORT FOR THE PROPOSED ESTABLISHMENT OF ROOSBOOM EXTENSION ONE ON PORTION 437 OF THE FARM ROOSBOOM 1102 GS IN LADYSMITH, KWAZULU-NATAL

Report Number: 2017/J026/SSS

FINAL REPORT
5 July 2017

Prepared by: Soilkraft cc

PO Box 73478

Lynnwood Ridge

0040

(012) 991 0426

On Behalf of: SSS Invest (Pty) Ltd

PO Box 16165

Leondale

1424

082 468 0268

Compiled by: IJ Breytenbach (PhD, Pr. Sci. Nat.)

Table of Contents

Reg no CK 96/08031/23

PO Box 73478
Lynnwood Ridge
0040
Tel: 012-9910426
Fax: 012-9912555
Email: izak@soilkraft.co.za

A PHASE ONE GEOTECHNICAL REPORT FOR THE PROPOSED ESTABLISHMENT OF ROOSBOOM EXTENSION ONE ON PORTION 437 OF THE FARM ROOSBOOM 1102 GS IN LADYSMITH, KWAZULU-NATAL

1 INTRODUCTION

1.1 Appointment

Soilkraft cc was appointed by Mr Silver Shalonga on behalf of SSS Invest (Pty) Ltd to conduct a geotechnical investigation on portion 437 of the farm Roosboom 1102 GS as part of the requirements for the proposed establishment of Roosboom Extension One, near Ladysmith, KwaZulu-Natal.

The purpose of the investigation was to:

- assess the suitability of the site for the proposed township establishment
- identify possible relevant geotechnical constraints
- propose preliminary and general recommendations regarding the founding of structures
- comment on any matters related to the geotechnical conditions

1.2 Scope of the Investigation

The report is compiled in such a way that it comprises a phase one investigation, as described by the SANS634 specification for residential township establishment. The investigation therefore does not constitute a phase two, structure-specific or stand-specific investigation.

2 AVAILABLE INFORMATION

The following sources of information were consulted:

- 1 : 50 000 scale topographical map: 2829DA Spioenkop, published in 2002
- 1 : 250 000 scale geological map: 2828 Harrismith, published in 1998

3 SITE DESCRIPTION

3.1 Site Location

The area investigated consisted of portion 437 of the farm Roosboom 1102 GS, some 12km south west of Ladysmith, in the Alfred Duma Local Municipal district. The area lies just south of the existing Roosboom rural settlement area, on the western side of the provincial road R103 between Ladysmith and Colenso. The study area was approximately 77ha in total size.

Site access was obtained via unpaved road D637 which leads from the provincial road R103 in a westerly direction. The road crosses through the northern tip of the study area.

Figure 1 illustrates the approximate position of the study area.

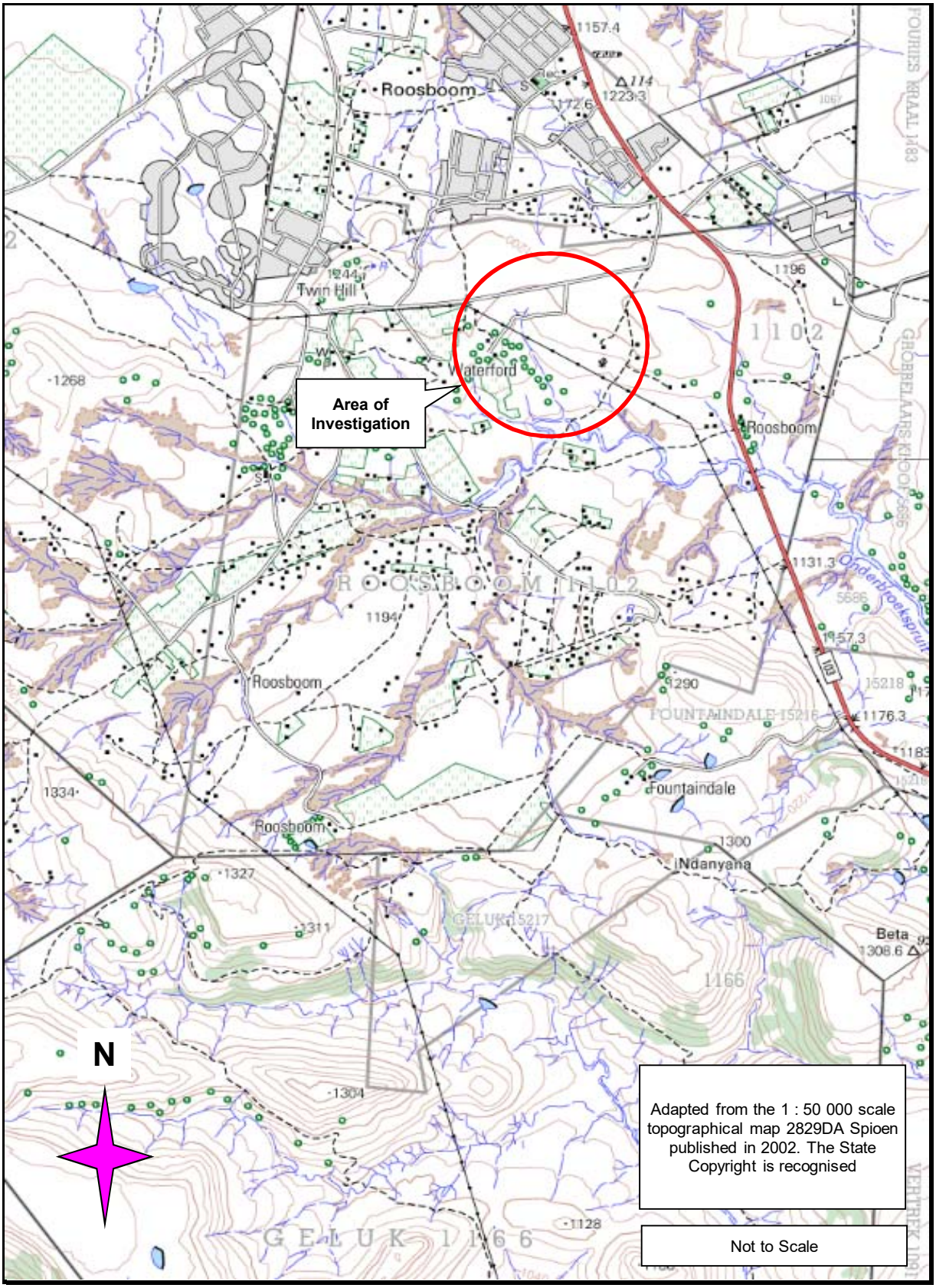
3.2 Topography and Drainage

Based on the regional topographical map, the site is situated between altitudes of 1140m and 1200m above mean sea level. The landscape can best be descried as undulating, typical of the Natal Highlands. The site generally dips to the south towards the so-called Onderbroekspruit. Localised bedrock outcrop forms thin ridges or terrace-like features in places.

The study area is incised by at least one non-perennial stream which drains in a south south easterly direction. This non-perennial stream also drains into the Onderbroekspruit. Site drainage takes place by means of sheet wash and infiltration and excess surface runoff is destined to join the Onderbroekspruit.

3.3 Vegetation

Regional vegetation on the site complies with the summary of Mucina and Rutherford [Reference 9.1]. The vegetation forms part of the so-called KwaZulu-Natal Highland Thornveld, which is dominated by grassland and savannoid woodlands. The vegetation is described as least threatened. However, the site also hosted eucalyptus trees which were introduced on the western side of the study area.



SOIL KRAFT

LOCALITY PLAN

FIGURE 1

In addition to the regional vegetation, localised areas were encountered – concentrated along dolerite ridges – where aloe species occurred. The same setting also hosted numerous thorn trees, likely Acacia species.

3.4 Climate and Weather Conditions

Average rainfall in the region is estimated by Mucina and Rutherford [Reference 9.1] at 752mm, along with a mean annual temperature of 16.5ºC. The site is located in an area with an approximate Weinert N-value of 2.2 and a Thornthwaite Moisture Index very close to 0. Climatically the area may thus be described sub-humid. This signifies that chemical weathering of rock material will take place, rather than mechanical breakdown thereof, resulting in the formation of active clays if suitable parent material is available. Minerals such as amphiboles, pyroxenes and olivine are particularly susceptible to this type of weathering. That being stated, the effects of mechanical weathering cannot be disregarded, particularly where brittle materials are involved.

4 EXISTING FACILITIES

At the time of the investigation, the study area was found to consist of open, vacant land. No structures or residences were found; however the unpaved road (D637) cut through the northern parts of the site, while an overhead electrical line also crosses the site from the south east to the north west. A bulk water pipeline follows the unpaved road and is clearly marked with markers along the route. A defunct bridge was observed near the central northern site boundary and presumably allowed access to farmsteads in decades gone past.

In addition to the above, at least one enclosed cemetery and a ruin was in the central western part of the study area. The topographical site survey supplied for the project also showed numerous graves across the study area.

Photo 1: Site Conditions shows typical site conditions at the time of the site investigation.

5 SITE INVESTIGATION

5.1 Trial Holes

The area was investigated by means of conventional trial holes. The site investigation work was done on 6 and 7 June 2017. A total of 45 trial hole positions were pre-determined for excavation and the positions were distributed across the study area in a representative fashion, while avoiding areas known to be environmentally sensitive (i.e. drainage features) and marked graves or cemeteries. Trial holes were excavated using a Cat 428F, arranged by the client.

SOIL KRAFT

SITE CONDITIONS

PHOTO 1

Trial holes were entered, inspected, profiled and (where suitable) sampled by a professionally registered engineering geologist according to the SANS633 specification. For the non-geotechnical reader, these guidelines are summarised in the attached Table 1: Soil Profiling Parameters and the trial hole profile descriptions are included in Appendix A. The profile descriptions reflect the impressions created by the pedological conditions and may vary from the results of the soil tests. The placement of trial holes is illustrated in Figure 2.

5.2 Materials Tests

Material samples were collected from trial holes across the entire site in a representative fashion. The samples were delivered to Specialised Testing Laboratory (Pty) Ltd in Pretoria for analyses. STL is a SANAS accredited geotechnical laboratory. The tests performed as part of this investigation included the following:

- Foundation indicator tests were performed to determine the general geotechnical properties of soil materials. The test includes a grading analysis, hydrometer analysis and the determination of Atterberg Limits. Results are also used to estimate the materials' expansiveness.
- Soil chemistry tests were done by assessing the soil paste acidity (i.e. pH) and conductivity. This is done to determine the corrossivity of soil materials, as it may affect the rate of corrosion of metallic services and utilities installed below ground level (e.g. pipes, joins, anchor poles, etc.).
- Undisturbed block samples were collected for consolidation test analyses. These tests were performed to assess in situ materials' susceptibility to settlement under loading.
- During the investigation it became apparent that some materials may be susceptible to dispersion and erosion. As a result, limited double hydrometer tests were performed on materials where erosion channels occurred to assess whether the erosion did indeed occur due to dispersive soil.

The results of the soil tests may be found in Appendix B to this report. For easy reference the foundation indicator test results are summarised in the attached Table 2: Results of Soil Tests.

6 DISCUSSION

6.1 Regional Geology

Regional geological information indicates that the study area is underlain by three main geological units. In chronological order these include:

- *Quaternary Deposits:* Fine grained sediments and silcrete deposits are depicted on the study area dotted yellow. These deposits typically occur in lower-lying areas near the study area.

TABLE 1: SOIL PROFILING PARAMETERS

CONSISTENCY : GRANULAR SOILS

SPT N	GRAVELS & SANDS Generally free draining soils		DRY DENSITY (kg/m^3)
<4	Very loose	Crumbles very easily when scraped with geological pick.	<1450
4-10	Loose	Small resistance to penetration by sharp pick point.	1450-1600
10-30	Medium dense	Considerable resistance to penetration by sharp pick point.	1600-1750
30-50	Dense	Very high resistance to penetration by sharp pick point. Requires many blows by pick point for excavation.	1750-1925
>50	Very dense	High resistance to repeated blows of geological pick. Requires power tools for excavation.	>1925

CONSISTENCY : COHESIVE SOILS

SPT N	SILTS & CLAYS and combinations with SANDS. Generally slow draining soils		UCS (kPa)
<2	Very soft	Pick point easily pushed in 100mm. Easily moulded by fingers.	<50
2-4	Soft	Pick point easily pushed in 30mm to 40mm. Moulded by fingers with some pressure.	50-125
4-8	Firm	Pick point penetrates to 10mm. Very difficult to mould with fingers.	125-250
8-15	Stiff	Slight indentation by pick point. Cannot be moulded by fingers. Penetrated by thumb nail.	250-500
15-30	Very stiff	Slight indentation by blow of pick point. Requires power tools for excavation.	500-1000

SOIL TYPE

SOIL TYPE	PARTICLE SIZE (mm)
Clay	<0.002
Silt	0.002-0.06
Sand	0.06-2.0
Gravel	2.0-60.0
Cobbles	60.0-200.0
Boulders	>200.0

MOISTURE CONDITION

Dry	No water detectable
Slightly moist	Water just discernible
Moist	Water easily discernible
Very moist	Water can be squeezed out
Wet	Generally below water table

COLOUR

Speckled	Very small patches of colour <2mm
Mottled	Irregular patches of colour 2-6mm
Blotched	Large irregular patches 6-20mm
Banded	Approximately parallel bands of varying colours
Streaked	Randomly orientated streaks of colour
Stained	Local colour variations : Associated with discontinuity surfaces

SOIL STRUCTURE

Intact	No structure present.
Fissured	Presence of discontinuities, possibly cemented.
Slickensided	Very smooth, glossy, often striated discontinuity planes.
Shattered	Presence of open fissures. Soil break into gravel size blocks.
Micro shattered	Small scale shattering, very closely spaced open fissures. Soil breaks into sand size crumbs.
Residual structures	Residual bedding, laminations, foliations etc.

ORIGIN

Transported	Alluvium, hill wash, talus etc.
Residual	Weathered from parent rock e.g. residual granite
Pedocretes	Ferricrete, silcrete, calcrete etc.

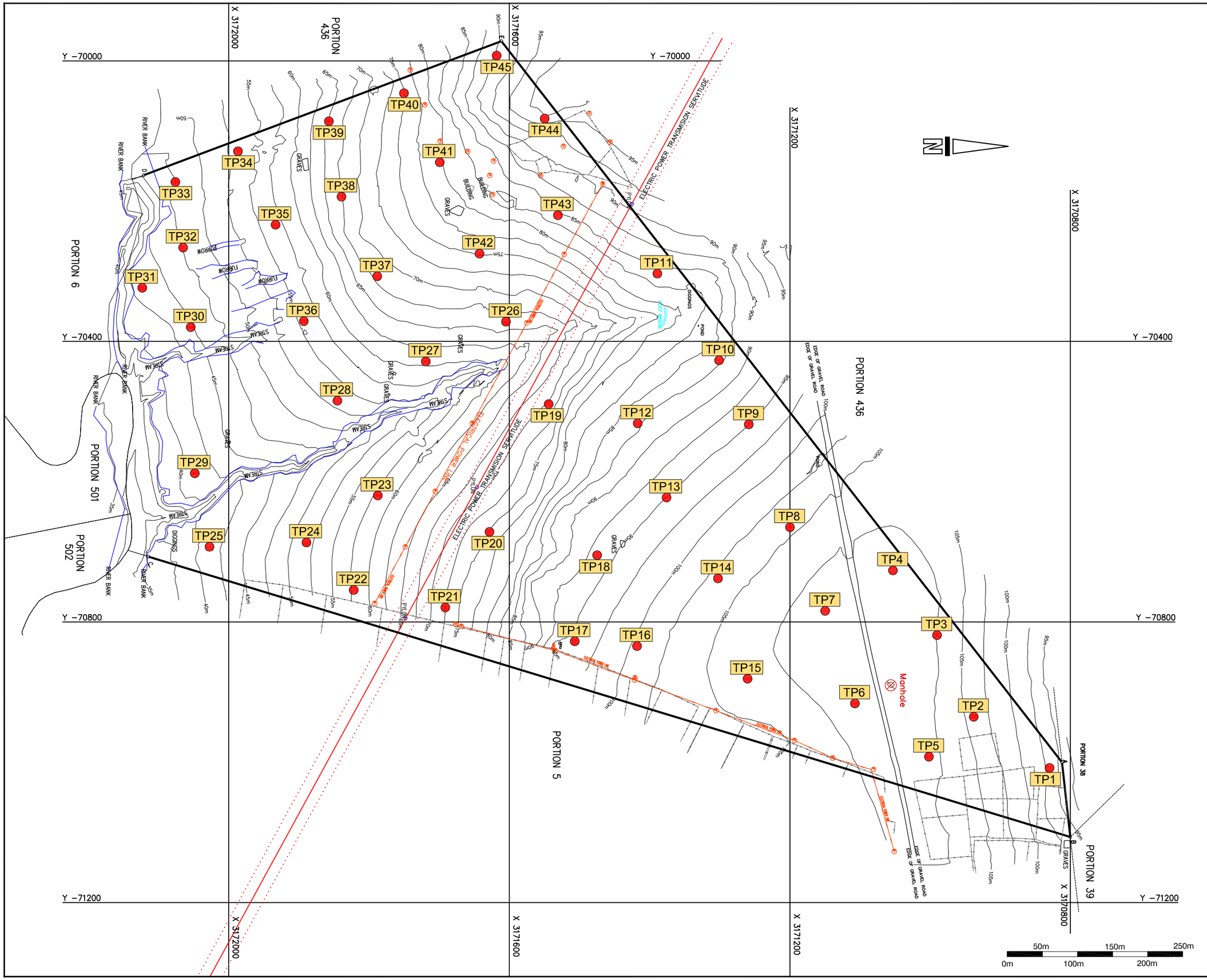
DEGREE OF CEMENTATION OF PEDOCRETES

TERM	DESCRIPTION	UCS (MPa)
Very weakly cemented	Some material can be crumbled between finger and thumb. Disintegrates under knife blade to a friable state.	0.1-0.5
Weakly cemented	Cannot be crumbled between strong fingers. Some material can be crumbled by strong pressure between thumb and hard surface. Under light hammer blows disintegrate to a friable state.	0.5-2.0
Cemented	Material crumbles under firm blows of sharp pick point. Grains can be dislodged with some difficulty by a knife blade.	2.0-5.0
Strongly cemented	Firm blows of sharp pick point on hand-held specimen show 1-3mm indentations. Grains cannot be dislodged by knife blade.	5.0-10.0
Very strongly cemented	Hand-held specimen can be broken by single firm blow of hammer head. Similar appearance to concrete.	10.0-25.0

FIGURE 2

LEGEND :

TP1 TRIAL HOLE



FOR ILLUSTRATIVE PURPOSES ONLY

SOIL KRAFT

Tel: 012 991 0426
Fax: 012 991 2555
Cell: 082 577 6215
E-Mail: izak@soilkraft.co.za
Website: www.soilkraft.co.za

P.O. Box 73478, Lynnwood Ridge, 0040

TAAK: JOB NAME: Proposed Roosboom Extension One

KLIËNT: CLIENT: SSS Invest (Pty) Ltd

TEKENING NO: DRAWING NO: Site Layout Plan

DATUM: DATE: 7 July 2017

TABLE 2 : SUMMARY OF SOIL TESTS

TRIAL HOLE NO	SAMPLE NO	DEPTH (mm)	SOIL ORIGIN	SOIL TYPE	GM	PI	LL	% CLAY (<0,002 mm)	ACTIVITY CLASS	pH	CON-DUCTIVITY (S/m)	SOIL CLASS	
												PRA	UNIFIED
2	SKT-42-262	400 - 1100	Residual shale	Gravelly sand	1.18	8	25	10	Low	6.9	0.0132	A-4	SC-SM
6	SKT-42-263	0 - 400	Colluvium 1	Silty sand	0.96	4	21	8	Low			A-4	SM
10	SKT-42-265	0 - 400	Colluvium 2	Silty sand	0.72	SP	SP	7	Low	7.6	0.0103	A-4	ML
14	SKT-42-266	500 - 1500	Residual shale	Silty sand	0.77	5	23	4	Low	7.9	0.0109	A-4	SC-SM
18	SKT-42-267	500 - 900	Residual shale	Silty sand	0.79	15	35	16	Medium			A-6	CL
19	SKT-42-268	400 - 900	Ferruginised residual sandstone	Clayey sand	0.63	17	32	21	Medium			A-6	SC
22	SKT-42-270	1200 - 2300	Ferruginised residual sandstone	Clayey sand	0.74	17	30	18	Medium	7.3	0.0093	A-6	SC

TABLE 2 : SUMMARY OF SOIL TESTS (CONTINUED)

TRIAL HOLE NO	SAMPLE NO	DEPTH (mm)	SOIL ORIGIN	SOIL TYPE	GM	PI	LL	% CLAY (<0,002 mm)	ACTIVITY CLASS	pH	CON-DUCTIVITY (S/m)	SOIL CLASS	
												PRA	UNIFIED
25	SKT-42-271	600 - 1000	Residual shale	Clayey sand	0.50	30	50	36	High	7.6	0.0424	A-7-6	CH
26	SKT-42-272	400 - 1500	Ferruginised residual sandstone	Silty sand	0.61	17	31	18	Medium			A-6	SC
28	SKT-42-273	700 - 2300	Ferruginised residual shale	Clayey sand	0.64	27	46	28	Medium to high	7.1	0.0472	A-7-6	CL
30	SKT-42-274	400 - 800	Colluvium 3	Clayey sand	0.67	16	32	27	Medium			A-6	CL
33	SKT-42-275	0 - 600	Colluvium 2	Gravelly sand	1.08	4	20	10	Low			A-2-4	SM
35	SKT-42-276	0 - 700	Colluvium 2	Silty sand	0.75	3	17	5	Low	6.5	0.0061	A-2-4	SM
39	SKT-42-277	400 - 900	Ferruginised residual sandstone	Clayey sand	1.04	5	24	24	Low	7.0	0.0071	A-4	SC-SM

TABLE 2 : SUMMARY OF SOIL TESTS (CONTINUED)

TRIAL HOLE NO	SAMPLE NO	DEPTH (mm)	SOIL ORIGIN	SOIL TYPE	GM	PI	LL	% CLAY (<0,002 mm)	ACTIVITY CLASS	pH	CON-DUCTIVITY (S/m)	SOIL CLASS	
												PRA	UNIFIED
40	SKT-42-278	1100 - 2400	Residual dolerite	Silty sand	0.66	24	50	23	Medium	6.8	0.0453	A-7-6	CH
45	SKT-42-279	700 - 1500	Residual dolerite	Sandy clay	0.21	36	69	37	Very high	7.1	0.0249	A-7-5	CH

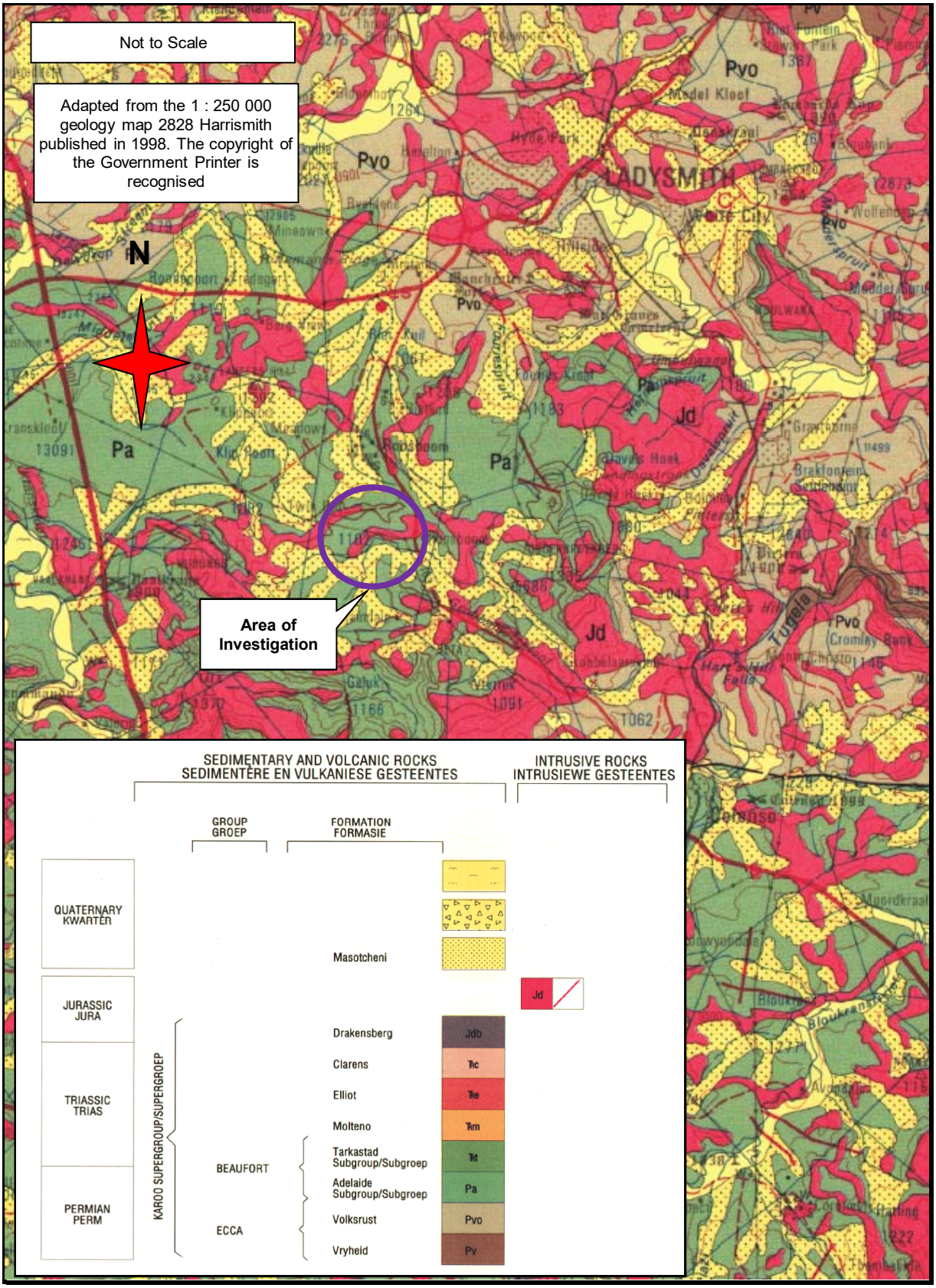
- *Dolerite:* Dolerite (Jd) intrusions are marked across the entire region and are erratic in distribution. The dolerite was verified both on site and in adjacent areas. The dolerite is geologically younger than the sedimentary bedrock materials in the region and intruded through said materials. Where intrusion occurred, the sedimentary host materials often get baked by thermal, contact metamorphism effectively hardening the sedimentary bedrock.
- *Adelaide Subgroup:* The Adelaide Subgroup (Pa) forms part of the Beaufort Group of the Karoo Supergroup. The Subgroup is indicated over much of the study area and regional information suggests that bedrock materials consist of grey mudstone, dark grey shale, siltstone and sandstone.

No fault zones are indicated in the vicinity of the study area. The attached Figure 3: Regional Geology Map allows an overview of the geology of the area. Using trial hole data, a basic model of the site geology was compiled, as illustrated in Figure 4. It must be emphasised, however, that the figure does not constitute a detailed geological model, as this falls beyond the scope of the geotechnical investigation. Also, the sedimentary bedrock (i.e. shale and sandstone) materials proved to alternate over short intervals both vertically and laterally. It is therefore possible that any particular sedimentary profile may contain both sandstone and shale bedrock, such as encountered in trial hole 42.

6.2 Soil Profiles

Prior to discussing the geotechnical zoning of the land, it is important to distinguish between the different materials present on site. The distribution of the materials across the study area is summarised in Table 3. The materials encountered were simplified and summarised as follows:

- *Colluvium 1:* The first colluvial material discerned across the site consisted of silty sand material which generally had a medium dense or dense consistency. The horizon was mostly characterised by dark grey or brown colour shades and had an intact material structure. Mixed gravel fragments were also commonly found in the horizon and most often consisted of shale gravel. As the material is of surficial distribution only, sampling was limited to a single sample. Test results confirmed that the material has a low heave potential as active clay content and a plasticity index of 8% and 4% were recorded, respectively. The material had a grading modulus of 0.96 and was awarded a PRA classification of A-4.
- *Colluvium 2:* The second colluvial horizon discussed here includes an array of colluvial materials found across the site. All of these materials have the same core properties in that they consist of silty or gravelly sand with a loose or very loose consistency and intact structure. Material colours showed some variation and commonly included light grey, dark grey, light brown and dark brown. The material test result confirmed that this colluvial horizon is also unlikely to heave. Active clay contents ranged from 5% to 10%, while plasticity indices were below 4%. At least one sample proved to be semi-plastic. The material had grading moduli between 0.72 and 1.08 and PRA classifications included A-2-4 and A-4. Two consolidation test sample were extracted from this



SOIL KRAFT

REGIONAL GEOLOGY

FIGURE 3

FIGURE 4

LEGEND :

- TP1 — TRIAL HOLE
- INFERRED MATERIAL BOUNDARY
- DOLERITE
- SHALE
- SANDSTONE

FOR ILLUSTRATIVE PURPOSES ONLY

SOIL KRAFT
Tel: 012 991 0426
Fax: 012 991 2555
Cell: 082 577 6215
E-Mail: izak@soilkraft.co.za
Website: www.soilkraft.co.za
P.O. Box 73478, Lynnwood Ridge, 0040

TAAK: / JOB NAME: Proposed Roosboom Extension One

KLIËNT: / CLIENT: SSS Invest (Pty) Ltd

TEKENING NO: / DRAWING NO: Site Geology

DATUM: / DATE: 7 July 2017

TABLE 3: MATERIAL DISTRUBUTION

Material	Trial Holes	Thickness Range (mm)
Colluvium 1	1-3, 5, 6, 25, 26, 38	200 – 600
Colluvium 2	4, 7, 8-10, 13-16, 21, 22, 24, 27-30, 32, 33, 35-37, 39, 41-43	200 – 1000
Colluvium 3	12, 17, 18, 30, 31, 33, 40, 45	300 – 700
Ferruginised Colluvium	2, 6, 8, 10, 13, 15, 17, 19-21, 23-25, 41, 42	100 – 600
Residual Shale	2, 14, 18, 23, 25, 30, 32	400 – 1400
Ferruginised Residual Shale	12, 18, 27-29, 31, 33, 34, 36, 37, 43	200 – 1600
Residual Sandstone	19, 34, 36, 39, 41	400 – 1200
Ferruginised Residual Sandstone	19, 22, 26, 35, 39, 41	500 – 1500
Ferricrete	11, 37	100 – 300
Calcified Residual Shale	34	1000
Ferruginised Residual Dolerite	40	500
Residual Dolerite	40, 45	1300

colluvial horizon and the results proved that both samples are moderately susceptible to settlement under relatively low loads (e.g. 50kPa). Site observations also suggested that the colluvial material is dispersive. This observation was confirmed when double hydrometer test results recorded dispersion ratios between 57% and 84%.

- *Colluvium 3:* The third colluvial horizon was discernible due to its tendency towards a cohesive material. Simply stated, whereas other colluvial materials were largely granular or sandy, this colluvial soil consisted of clayey sand material. As with materials discussed above, this horizon showed some variation in physical properties. The material mostly had a dark brown or dark grey colour, while a shattered structure and medium dense consistency were commonly recorded. Laboratory test analyses suggest the material is moderately expansive, with results indicating 27% active clay content and a plasticity index of 16%. In addition, the material had a grading modulus of 0.67 and was awarded a PRA classification of A-6. As with the colluvium 2 horizon, the colluvium 3 material was proved to be dispersive, with test results revealing a dispersion ratio of 91%.
- *Ferruginised Colluvium:* The ferruginised colluvium horizon occurred sporadically throughout the entire study area and was not only limited to lower lying areas. As the horizon was mostly of

limited thickness, it was not sampled. Nevertheless, a general description recorded described the horizon as dark brown or grey gravelly or silty sand with black and/or orange discolourations. The horizon generally had a medium dense or loose consistency and intact structure, though a voided structure was occasionally observed. Critically, the horizon often contained gravel and cobbles of mixed origins (i.e. sandstone, shale and even dolerite).

- *Pedogenic Ferricrete Deposits:* Pedogenic deposits – in the form of ferricrete – were identified in two trial holes. In trial hole eleven the pedogenic material consisted of nodular ferricrete with dark brown mottled black and orange colour, a dense consistency and an intact structure. In trial hole 37 the material also constituted nodular ferricrete and the material was described as dark brown mottled black and orange clayey, sandy gravel with a shattered structure and loose consistency. Due to its very limited occurrence, the materials were not sampled.
- *Calcified Residual Shale:* Residual shale materials encountered in lower elevated parts of the site – most notably adjacent to the Onderbroekspruit – were found to be calcified. The light grey blotched white sandy clay had a stiff consistency and slickensided structure. This material was not sampled due to its limited occurrence, but the slickensided structure suggests that the material is expansive and therefore likely has similar properties to that of the uncalcified residual shale, as discussed below.
- *Residual Shale:* This material was encountered abundantly across the study area and as is to be expected, physical properties also varied. The material generally had grey yellow or light grey colour and consisted of silty sand, gravelly sand or clayey sand, depending on its position on the site. For the most part the granular materials had a medium dense to dense consistency, while cohesive materials had a firm to stiff consistency. Intact or laminated structures were commonly identified. Laboratory test analyses proved that the material ranged from a low expansiveness (i.e. gravelly sand) to a medium and even high expansiveness. The test samples contained between 4% and 35% active clay content and had plasticity indices between 5% and 30%. These parameters confirm the high degree of variability in the weathering of the materials. Grading moduli were between 0.50 and 1.18 and PRA classifications included A-4, A-6 and A-7-6.
- *Ferruginised Residual Shale:* Ferruginised residual shale occurred more frequently than regular residual shale and while physical properties were often similar, the ferruginised horizon showed clear signs of discolouration or oxidation. This resulted in orange and black colour modifications but the horizon was often of a limited vertical thickness. Material test results showed that the material borders between a medium and high expansiveness. Active clay content of 28% was recorded, along with an associated plasticity index of 27%. The material had a grading modulus of 0.64 and was classified as A-7-6 according to the PRA classification system.
- *Residual Sandstone:* Residual sandstone was encountered on limited occasions and generally showed the tendency to grade into weathered bedrock. For this reason the material was not sampled. For the most part the horizon had dark grey brown or light grey colour, an intact or laminated structure and a medium dense or dense structure. The material was also clearly micaceous, a feature originating from the micaceous nature of the parent material.

- *Ferruginised Residual Sandstone:* This material again displayed colours and discolouration typical of ferruginised material. The horizon mostly consisted of clayey sand with an intact structure and medium dense consistency. A micaceous component was again observed in places. Laboratory test analyses indicated that three of the four test samples are moderately expansive, with the fourth having a low expansiveness. Active clay content ranged from 24% to 32% and associated plasticity indices were between 5% and 17%. The calculated grading moduli ranged from 0.61 to 1.04 and PRA classifications included A-4 and A-6.
- *Residual Dolerite:* The penultimate material identified comprised residual dolerite, which was identified in two trial holes. The residual soil had clearly been chemically weathered to varying extents along the topography and as a result, the material ranged from silty sand to sandy clay. The residual horizons showed typical colour changes with depth, often seen in a dolerite profile, with dark red being common closer to the surface and grading into a yellow brown or green grey material at depths. The cohesive materials had a soft consistency while granular materials had a medium dense consistency. An intact structure was recorded in all instances. Test results showed that that material has a medium to very high expansiveness, again, depending on the degree to which chemical weathering had proceeded. Active clay contents ranged from 23% to 37%, while plasticity indices were between 24% and 36%. The material had grading moduli between 0.21 and 0.66, while PRA classifications included A-7-5 and A-7-6. Corestones were commonly found in this horizon.
- *Ferruginised Residual Dolerite:* This last material was found only in trial hole 40, where it occurred as orange brown speckled black clayey sand with an intact structure and medium dense consistency. As the material was only encountered on one occasion, it was not sampled.

6.3 Groundwater

- *Perched Water*: No seepage water was encountered in any of the trial holes excavated during the investigation. It must be taken into account, however, that perched groundwater is a strongly seasonal phenomenon which is most dominant between the middle and end of the rainy season, while mostly being absent during the dry season. In this instance, the investigation was conducted during the region's dry season. Considering the indicators observed in trial holes, it is expected that seasonally perched water may occur on this site and could potentially be very problematic. The likelihood and severity of such a condition must be established during a groundwater or geohydrological investigation. The outcome of such an investigation may also affect the recommendation of the investigation hand.
- *Permanent Water*: Vegter[Reference 9.2] indicates the probability for drilling successfully for water in the area to be more than 60% but the probability that such a borehole will yield more than 2l/s is between 10% and 20%. Groundwater is expected to occur at depths between ten and twenty metres in compact, dominantly argillaceous strata.

6.4 Geotechnical Zoning

The references contained in this section are applicable to township establishment only and describe general conditions encountered. When discussing the geotechnical conditions of the area, it is important to keep the following issues in mind:

- *Properties of Heave*: Material test results indicate that the majority of the residual soils – as well as some colluvial soils – are expansive. Severity of heave in those instances ranged from a moderate expansiveness to a very high expansiveness. Using the results of the soil tests in the parametric heave calculation method as proposed by Van der Merwe[Reference 9.3], free heave was calculated where relevant.
- *Properties of Settlement*: Based on site observations and material test results, it appears that settlement in the form of consolidation will largely be limited to colluvial soils. The colluvial materials proved moderately susceptible to compression settlement, assuming loading scenarios akin to that of single storey masonry structures.
- *Wetland and Flood Plains*: Areas identified as potential wetlands or floodplains were avoided during this investigation. At the time of report compilation, the flood lines were yet to be established.
- *Perched Water and Seepage*: It is expected that much of the study area will experience seasonally perched water or shallow groundwater ingress. As the investigation was conducted during the dry season (when such conditions are generally absent), the extent and severity of any perched or seepage water remains to be assessed.
- *Erosion and Dispersive Soils*: Erosion channels were located largely in the southern parts of the site and these features appear to be associated with proven, dispersive soils. It is therefore expected that in situ materials – colluvium in particular – will be very susceptible to erosion.
- *Areas of Bedrock Outcrop*: Bedrock outcrop was encountered across the site and was often distributed erratically and sporadically.

The geotechnical classification of the property is in accordance with the guidelines of the NHBRC[Reference 9.4]. Within the limitations of the scope of the investigation and based on the principles as explained above, the study area can be divided into the following zones:

- *Zone 1:* ***R*** *or* ***S/R***: Zone 1 covers a large portion of the study area and is characterised by areas of bedrock outcrop, or areas with shallow bedrock and limited soil cover. In the latter case, soil movement in the soil material is expected to be limited to less than 10mm compression settlement. Of significance, though, is that the overburden material – especially in the northern parts of the study area – often contained oversized fragments (e.g. cobbles), which may cause differential settlement if founded upon. Localised areas in the southern parts of the site are also awarded this classification; however these areas have one notable difference in that overburden

material had been removed by erosion, resulting in thinner soil profile overlying bedrock, compared with their immediate surroundings.

- *Zone 2:* ***H1/R*** *or* ***S/H1/R***: This zone is distributed erratically across the site and is likely a function of topography, geology and weathering associated with drainage. Soil movement in this zone is expected to be dominated by unrestrained heave of up to 15mm (**H1**) while loose overburden in places may also see compression settlement of up to 10mm (**S**). Bedrock was proven in this zone at depths shallower than 1000mm, while localised bedrock outcrop was also encountered occasionally.
- *Zone 3:* ***S1***: Zone 3 includes only trial hole fourteen and its immediate surroundings. The zone is somewhat peculiar as it is the only area in the study area where settlement of up to 20mm is expected to occur. It is likely, however, that more such areas may occur at localised positions in the study area and that such areas were simply not intercepted during the investigation.
- *Zone 4:* ***H1-H2*** *or* ***S/H1-H2***: The areas included in this zone are mostly restricted to the southern parts of the study area where the soil profiles have been notably weathered. Expansive residual materials – originating both from dolerite and sedimentary bedrock – are expected to produce unrestrained heave between 7.5mm and 30mm. The vertical thickness and expansiveness of the materials combined are simply too variable to further separate the zone into more clearly defined areas (i.e. **H2** or **H3** only). Dispersive soils and erosion dongas occur in this zone, as illustrated in Photo 2.
- *Zone 5:* ***H3***: Zone 5 includes the remainder of the site and is mostly distributed along the flanks of water courses. Soil profiles are deeply and extensively weathered, likely due to the effects of the adjacent water courses. A localised portion in the western corner of the site was also awarded this classification, but in this instance the profile consisted largely of expansive residual dolerite materials. It should be considered that a non-perennial stream occurs adjacent to this zone too, just outside the study area. Unrestrained soil heave in excess of 30mm is expected to occur in this zone, while erosion dongas and dispersive soils are also common.

The zonation is illustrated in Figure 5: Geotechnical Zoning. The indicated boundary lines between the individual zones are inferred and must not be considered as a set boundary. It is essential that the zoning be refined during the phase two investigation. *The zoning may also be modified once flood line assessments and a groundwater study had been undertaken.*

In addition to the geotechnical zoning, certain aspects need to be highlighted that may further affect the proposed development. Though already discussed to some extent, Figure 6 shows areas which require particular attention, as follows:

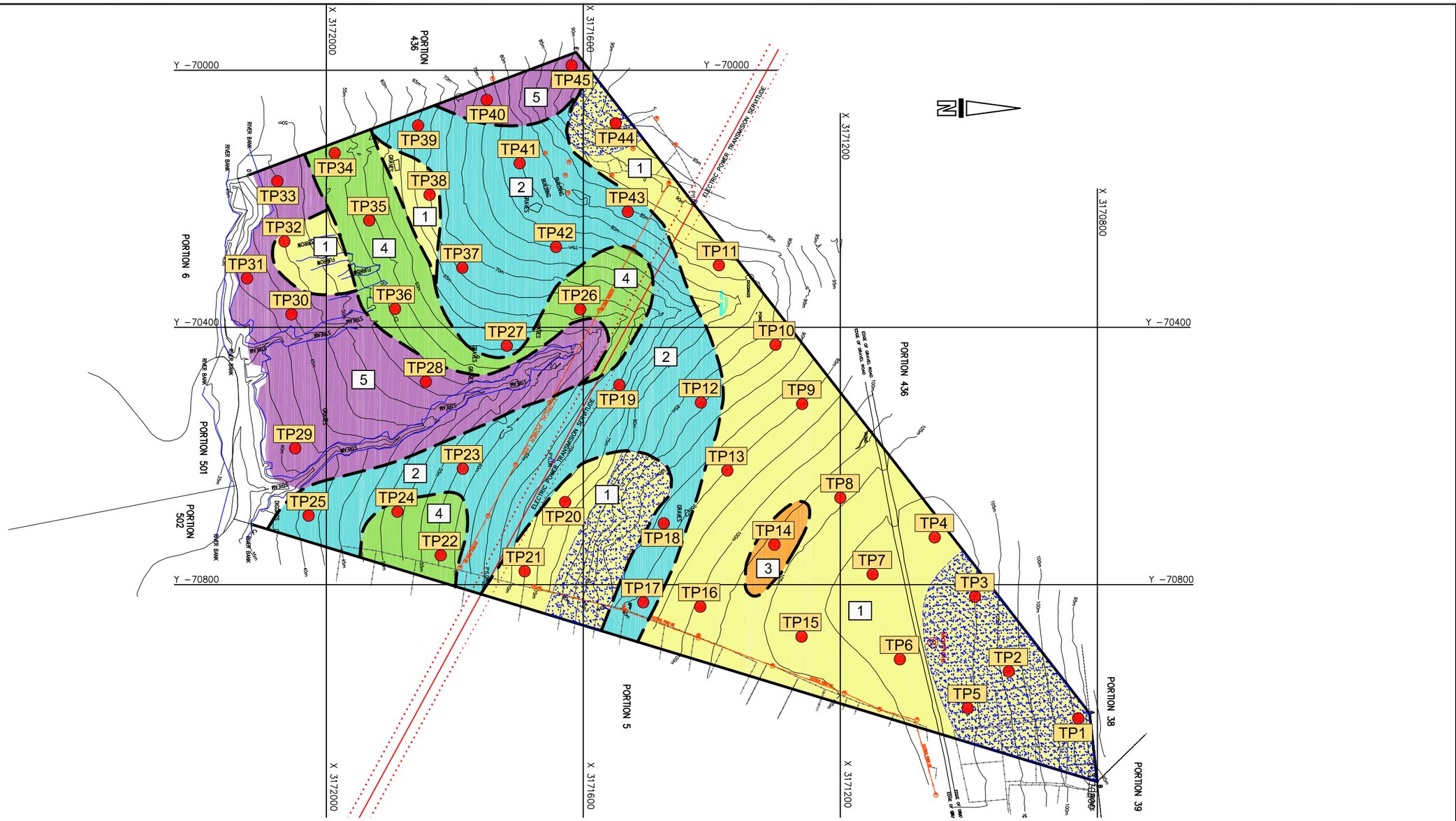
- *Areas of Bedrock Outcrop:* Though the proposed layout plan provided at the time of reporting seems to have taken into account areas of bedrock and associated steep slopes, it is worth discussing it here. While the sandstone or shale bedrock encountered in the northern parts of the study area are to a large degree manageable or workable, the dolerite outcrops are

SOIL KRAFT

SOIL EROSION AND DISPERSIVE SOILS

PHOTO 2

FIGURE 5



LEGEND :

TP1 TRIAL HOLE

INFERRED MATERIAL BOUNDARY

AREAS OF PROMINENT BEDROCK OUTCROPS

FOUNDATION DESIGN, BUILDING PROCEDURES AND PRECAUTIONARY MEASURES

ZONE	GEOTECHNICAL CLASS	% OF TOTAL AREA	ESTIMATED SOIL MOVEMENT	SOIL PROFILE	DEVELOPMENT POTENTIAL	CONSTRUCTION TYPE	FOUNDATION DESIGN	ASSOCIATED PROBLEMS
1	R or S/R	44,1	Less than 10mm settlement	Limited colluvium overlying bedrock	Favourable	Normal	Strip footings or Slab on the ground	Bedrock outcrop Slaking shale Cobbles in overburden Corrosive soils Possible seasonal groundwater
2	H1/R or S/H1/R	28,1	Up to 15mm unrestrained heave; less than 10mm settlement in places	Colluvium overlying residual soils with shallow bedrock in places	Favourable	Modified normal	Reinforced strip footings	Sporadic bedrock Corrosive soils Possible seasonal groundwater
3	S1	1,0	Settlement of up to 20mm	Colluvium overlying residual shale	Intermediate	Modified normal	Reinforced strip footings	Corrosive soils Possible seasonal groundwater Sporadic occurrence of zone
4	H1-H2 or S/H1-H2	10,6	Unrestrained heave of up to 30mm; less than 10mm settlement in places	Colluvium overlying residual profile (mixed materials)	Intermediate	Modified	Reinforced raft	Corrosive soils Possible seasonal groundwater Risk of flooding Dispersive soils Erosion dongas
5	H3	16,2	Unrestrained heave exceeding 30mm	Variable; mostly colluvium overlying mixed residual soils	Intermediate	Modified	Reinforced raft or Soil replacement raft	Corrosive soils Possible seasonal groundwater Risk of flooding Dispersive soils Erosion dongas

FOR ILLUSTRATIVE PURPOSES ONLY

SOIL KRAFT
Tel: 012 991 0426
Fax: 012 991 2555
Cell: 082 577 6215
E-Mail: izak@soilkraft.co.za
Website: www.soilkraft.co.za
P.O. Box 73478, Lynnwood Ridge, 0040

TAAK: JOB NAME: Proposed Roosboom Extension One

KLIËNT: CLIENT: SSS Invest (Pty) Ltd

TEKENING NO: DRAWING NO: Geotechnical Zoning

DATUM: DATE: 7 July 2017

FIGURE 6

LEGEND :

- TP1 — TRIAL HOLE
- INFERRED MATERIAL BOUNDARY
- AREAS OF OUTCROP
- AREAS OF EROSION AND DONGAS

FOR ILLUSTRATIVE PURPOSES ONLY

SOIL KRAFT
Tel: 012 991 0426
Fax: 012 991 2555
Cell: 082 577 6215
E-Mail: izak@soilkraft.co.za
Website: www.soilkraft.co.za
P.O. Box 73478, Lynnwood Ridge, 0040

TAAK: JOB NAME: Proposed Roosboom Extension One

KLIËNT: CLIENT: SSS Invest (Pty) Ltd

TEKENING NO: DRAWING NO: Geotechnical Problem Areas

DATUM: DATE: 7 July 2017

50m 150m 250m
0m 100m 200m

associated with steep slopes and very difficult excavation (to be discussed later). This area is therefore considered “least favourable” with regard to steep slopes and excavatibility and is generally not considered suitable for development, as already applied to the development plan.

- *Erodibility of Soil:* Erosion in geotechnical zones 4 and 5 are associated with dispersive soils proved during the investigation. The erodibility of the soils is considered to be “high” and therefore this aspect is classified as “least favourable” for development. As with areas of steep slopes, the proposed township layout plan already takes into account the distribution of erosion features; however, measures will be required to ensure that erosion does not propagate further once the township has been established.
- *Flood Lines and Wetland Buffers:* Flood lines and associated wetland buffer zones remain to be established by suitably applicable investigations.
- *Groundwater Conditions:* Groundwater conditions and the susceptibility/extent of seasonally perched water or seepage water levels remain to be investigated.

6.5 Conditions of Excavation

Conditions of excavation encountered during the site investigation can be summarised as follows:

- *Colluvium 1:* This material was excavatible by backhoe. While the soil matrix proved easily excavatible, the inclusion of cobble-sized rock fragments presented a challenge. Regardless of this, the said cobbles were manageable by a skilled plant operator.
- *Colluvium 2:* The second colluvial material proved easily excavatible by mechanical means due to a loose consistency. While cobbles and other large rocks were encountered in this horizon, the occurrence was far less frequent than with the colluvium 1 horizon.
- *Colluvium 3:* The third colluvial horizon also proved excavatible by backhoe, but often required significantly more effort to remove from the profile due to the material’s cohesive (i.e. clayey) nature.
- *Ferruginised Colluvium:* As before, the inclusion of cobbles in this horizon sometimes impeded excavation, but in general the horizon is considered excavatible with moderate effort.
- *Pedogenic Ferricrete Deposits:* The pedogenic materials were only encountered on two occasions and on these two occasions excavatibility were very different. In trial hole eleven the material had a dense consistency and required notable effort to penetrate; whereas in trial hole 37, the material was loose and easily excavatible.
- *Calcified Residual Shale:* Calcified residual shale proved challenging to excavate due to the material’s cohesive nature and stiff consistency. Despite this the material did not induce refusal of excavation. It is expected that conditions of clayey excavation may occur if this material is in a moist to wet state.

- *Residual Shale:* The residual shale essentially had similar excavation properties to the calcified residual shale, requiring some effort to excavate the material. Also, it is likely that conditions of clayey excavation will occur when the material is in a moist to wet state.
- *Ferruginised Residual Shale:* Ferruginised residual shale again had similar excavation properties to the residual shale material and proved machine excavatible with effort. Clayey excavation must once more be anticipated if the material is in a moist to wet state.
- *Residual Sandstone:* The residual sandstone exhibited the tendency to grade into weathered sandstone bedrock. With this in mind, the residual sandstone may be considered partially excavatible by backhoe.
- *Ferruginised Residual Sandstone:* This material was excavated with moderate effort. While the horizon generally consisted of clayey sand, it is possible that clayey excavation may occur when the material is in a very moist to wet state.
- *Residual Dolerite:* Excavation through the residual dolerite was plagued by the cohesive nature of the material (i.e. clayey excavation) and the inclusion of dolerite cobbles (i.e. corestones). Despite this, the material was still excavatible with the help of a skilled machine operator but a fair amount of persistence was necessary.
- *Ferruginised Residual Dolerite:* This material was only encountered on one occasion and proved excavatible with no impediments other than potential clayey excavation.
- *Shale Bedrock:* The shale bedrock was often found to be partially excavatible by backhoe, but induced gradual refusal of excavation fairly quickly. In areas where the shale had been baked (i.e. contact metamorphism with dolerite) it proved far less excavatible.
- *Sandstone Bedrock:* The sandstone bedrock also induced gradual or instant refusal of excavation where encountered. As with the shale bedrock, the material is considerably harder in areas where it had undergone heat metamorphism.
- *Dolerite Bedrock:* The dolerite bedrock encountered in outcrop on site was not excavatible and would require blasting or chemical dissolution to remove. Dolerite is known to be potentially very hard rock material with breaking strengths in excess of 200MPa.
- *Corestones:* The presence of dolerite corestones was proven during the investigation. The corestones were generally limited in size and could be managed by a skilled backhoe operator, though it is anticipated that some corestones may require larger excavation equipment to allow effective removal.
- *Excavation Stability:* Excavations made during the course of the investigation mostly proved to be stable. It is expected that perched or seepage water – if present – will severely detract from the excavation stability.
- *Wet Excavation:* Depending on the outcome of a groundwater study, it may be required to make provision for wet excavation on a seasonal basis.
- *General Comments:* Excavation by backhoe proved viable to depths between 300mm and 2400mm; however areas of bedrock outcrop may not be excavatible. 23 of the 45 trial holes (i.e. 51%) achieved depths of 1500mm or deeper.

- *Slope Stabilities*: No natural slope instabilities were observed during the investigation.
- *Slaking Mudrock*: Slaking mudrock was observed in the northern most portions of the study area in shale bedrock outcrop, as well as in the channel incisions of water courses.

To summarise the conditions of excavation, the reader is referred to Figure 6 which shows areas of predominant bedrock outcrop. In addition, Figure 7 also summarises the depth and types of refusal of excavation encountered in trial holes. In this figure positions marked as “No refusal of excavation” reflects trial holes which achieved depths in excess of 2000mm without encountering refusal of excavation.

6.6 Seismicity

Kijko[Reference 9.5] indicates the annual probability for an earthquake with intensity of 5.5 on the Modified Mercalli Scale to occur in the area to be less than 10^{-1} and with an intensity of 8.8 to occur the probability is 10^{-3}. A 10% probability exists that an earthquake with Peak Ground Acceleration of 0.06g to 0.10g may take place once in 50 years. To put the above information into perspective, Table 4 is attached to this report.

6.7 Soil Corrossivity

When discussing soil corrossivity, it is applicable to consider the guidelines as proposed by Evans[Reference 9.6]. The corrossivity of a soil towards buried, exposed, metallic surfaces is dependent on the following properties of the soil:

- Electrical conductivity
- Chemical properties of the soil
- Ability of the soil to support sulphate reducing bacteria
- Heterogeneity of the soil

The pH of a soil gives an indication of potential acid related problems. Should the soil pH be less than 6.0, corrosion may take place and should the pH be less than 4.50, the problem of corrosion may be serious. If the conductivity of the soil is less than 0.1mS/cm, corrossivity is generally not a problem. However, the corrosion potential of the soil increases with an increase in conductivity. Should the conductivity of the soil exceed 0.5mS/cm, the soil can be regarded as very corrosive. Should exposed metal pipes pass from argillaceous soils to arenaceous soils or vice versa, electrochemical cells are set up due to the different rates of oxygen diffusion of the soils. Sulphate reducing bacteria is usually present under anaerobic conditions, that is, typically saturated or waterlogged clays.

Samples were collected from the horizons most likely to host services and utilities in future. Results can be summarised as follows:

FIGURE 7

LEGEND :

- TP1 — TRIAL HOLE
- INSTANT REFUSAL OF EXCAVATION
- GRADUAL REFUSAL OF EXCAVATION
- NO REFUSAL OF EXCAVATION
- 1500mm — DEPTH OF REFUSAL

TP45 2000mm
TP40
TP39 1600mm
TP34 2400mm
TP44 0mm
TP41 2000mm
TP33
TP38 1400mm
TP35 2200mm
TP43 1500mm
TP32 1000mm
TP42 1800mm
TP37 1500mm
TP11 1100mm
TP31
TP30
TP36 1700mm
TP26 1700mm
TP27 1800mm
TP10 800mm
TP28
TP19 1700mm
TP12 1000mm
TP9 700mm
TP29
TP23 1400mm
TP13 1100mm
TP20 400mm
TP8 500mm
TP25 1500mm
TP24
TP18 900mm
TP14 1500mm
TP4 600mm
TP22
TP21 700mm
TP7 800mm
TP17 700mm
TP16 500mm
TP3 700mm
TP15 800mm
TP6 800mm
TP2 1600mm
TP5 300mm
TP1 500mm

Manhole

PORTION 6
PORTION 436
PORTION 501
PORTION 502
PORTION 5
PORTION 38
PORTION 39

X 3172000
X 3171600
X 3171200
X 3170800
Y −70000
Y −70400
Y −70800
Y −71200

ELECTRIC POWER TRANSMISION SERVITUDE
RIVER BANK
GRAVES
BUILDING
DIGGINGS
POND
EDGE OF GRAVEL ROAD
STREAM

N

0m 50m 100m 150m 200m 250m

FOR ILLUSTRATIVE PURPOSES ONLY

SOIL KRAFT
Tel: 012 991 0426
Fax: 012 991 2555
Cell: 082 577 6215
E-Mail: izak@soilkraft.co.za
Website: www.soilkraft.co.za
P.O. Box 73478, Lynnwood Ridge, 0040

TAAK/JOB NAME: Proposed Roosboom Extension One
KLIËNT/CLIENT: SSS Invest (Pty) Ltd
TEKENING NO/DRAWING NO: Summary of Excavation Depths
DATUM/DATE: 7 July 2017

TABLE 4 : EARTHQUAKE MAGNITUDE AND INTENSITY

MODIFIED MERCALLI INTENSITY SCALE	INTENSITY	DESCRIPTION	RICHTER SCALE MAGNITUDE	RADIUS OF PERCEPTIBILITY (km)
I	Instrumental	Detected only by seismography		
II	Feeble	Noted only by sensitive people	3.5 to 4.2	3 to 24
III	Slight	Like the vibrations due to a passing lorry. Felt by people at rest, especially on upper floors		
IV	Moderate	Felt by people while walking. Rocking of loose objects, including vehicles	4.3 to 4.8	24 to 48
V	Rather strong	Felt generally ; most sleepers are awakened and bells ring		
VI	Strong	Trees sway and suspended objects swing ; damage by overturning and filling of loose objects	4.9 to 5.4	48 to 112
VII	Very strong	General public alarm ; walls crack ; plaster falls	5.5 to 6.1	110 to 200
VIII	Destructive	Car drivers seriously disturbed; masonry fissured ; buildings damaged	6.2 to 6.9	200 to 400
IX	Ruinous	Houses collapse ; pipes break		
X	Disasterous	Ground cracks badly ; buildings destroyed ; railway lines bent ; landslides on steep slopes	7.0 to 7.3	400 to 700
XI	Very disasterous	Few buildings remain standing; bridges destroyed ; all services out of action ; great landslides and floods	7.4 to 8.1	400 to 700
XII	Catastrophic	Total destruction ; objects thrown into the air; ground rises and falls in waves	>8.1	400 to 700

- *Colluvium 2:* The colluvial material proved to have pH levels between 6.5 and 7.6, indicating a slightly acidic to slightly alkaline material. The material also had soil paste conductivity readings between 0.0061S/m and 0.0103S/m. The colluvium is therefore not considered corrosive on either account.
- *Ferruginised Residual Shale*: The ferruginised residual horizon proved to be nearly neutral with regard to pH (i.e. 7.1) and is therefore not considered corrosive with regard to acidity. However, the material had a conductivity of 0.0472S/m, suggesting it is corrosive in this regard.
- *Residual Shale*: Residual shale materials were sampled on three occasions due to the abundance of its occurrence. The results showed pH levels between 6.9 and 7.9, which suggest the material is effectively neutral to slightly alkaline and therefore not corrosive as far as acidity is concerned. In terms of conductivity, the material returned mixed results indicative of non-corrosive to corrosive soils, with results between 0.0109S/m and 0.0424S/m.
- *Ferruginised Residual Sandstone*: The ferruginised residual sandstone proved non-corrosive on account of pH and conductivity. pH values were between 7.0 and 7.3, while conductivity readings ranged from 0.0071S/m to 0.0093S/m.
- *Residual Dolerite*: The residual dolerite proved to be slightly corrosive to corrosive on account of material conductivity readings, which were between 0.0249S/m and 0.0453S/m. As far as acidity is concerned, the material can for all practical purposes be considered as neutral with pH readings between 6.8 and 7.1.
- *Seepage Water*: Cognisance must be taken of the fact that any seepage water will have an oxidising effect on metal objects (e.g. utilities) installed below surface.

6.8 Other Considerations

- *Historic Monuments*: To the author's knowledge there are no historic monuments on the site; however some ruins were found near trial hole 41.
- *Undermining*: The area is not subject to undermining.
- *Cemetery Sites*: A number of graves are marked on the site survey plan and at least one enclosed cemetery was found between trial holes 41 and 42.
- *Insect Nesting:* Insect nesting, such as ants and termites, was encountered sporadically throughout the site.
- *Eucalyptus Trees:* Cognisance must be taken of the fact that clusters of eucalyptus trees occurred on the western and southern parts of the site. These trees are known to extract large volumes of groundwater. As a result, it is likely that there will be an increase in groundwater moisture levels when the trees are removed to make way for development. Care should also be taken to ensure that all roots systems are removed so as not to leave behind rotting remnants which will form sub-surface voids in the long term.

7 CONCLUSIONS

Based on the findings of this investigation, the following issues must be taken into account:

- *Geology*: The site is underlain by sedimentary bedrock materials of the Adelaide Subgroup, Beaufort Group, Karoo Supergroup. The sedimentary materials have been intruded by dolerite dykes in places and covered by quaternary and alluvial deposits in lower lying areas.
- *Soil Profiles*: Soil profiles across the site are variable but generally consist of colluvial cover overlying residual profiles of shale, sandstone and/or dolerite materials. Areas of bedrock outcrop occur on site.
- *Groundwater*: Perched groundwater or seepage water was not encountered in trial holes, but it is expected that such water may occur on a seasonal basis and affect the proposed development adversely. The possibility and extent of such conditions remain to be verified by specialist studies.
- *Founding Conditions*: The study area is divided into five zones, namely **R or S/R**, **H1/R or S/H1/R**, **S1**, **H1-H2 or S/H1-H2** and **H3**. Detailed site and stand zoning must be verified during a phase two investigation. The zoning must also be revised once flood line and groundwater assessments have been completed.
- *Conditions of Excavation*: 51% of trial holes reached or exceeded a depth of 1500mm when excavating with a backhoe. Excavations are expected to be affected by seasonal groundwater influx and/or perched water levels. Conditions of clayey excavation may occur in most residual materials, while bedrock materials may need to be excavated or blasted.
- *Corrossivity:* Some soil materials on site proved to be corrosive, mostly on account of high soil conductivity properties.
- *Historic Monuments*: To the author's knowledge there are no historic monuments on the site.
- *Undermining*: The area is not subject to undermining.
- *Dolomite Stability*: The area is not subject to dolomite related instabilities.
- *Seismicity*: A 10% probability exists that an earthquake with Peak Ground Acceleration of 0.06g to 0.10g may take place once in 50 years.
- *Cemetery Sites*: Numerous graves were identified by the site survey team and are indicated on the topographical survey plan.
- *Insect Nesting:* Insect nesting, such as ants and termites, was encountered sporadically throughout the site.
- *Eucalyptus Trees:* Cognisance must be taken of the fact that clusters of eucalyptus trees occurred on the western parts of the site.
- *Erosion and Dispersive Soils:* Erosion dongas were found on site and are likely related to proven dispersive soil materials.

8 RECOMMENDATIONS

8.1 Proposed Development and Structural Recommendations

Taking into consideration the findings of the geotechnical investigation, the following general recommendations can be given as guidelines:

8.1.1 Geotechnical Zone 1: ***R or S/R***

Founding in this zone may be done by means of slab on the ground, or normal strip footings hosted on bedrock. Bedrock must be inspected and approved as suitable for construction by a competent person. Care must be taken to remove oversized rock fragments from the building foundations as founding on such cobbles may result in differential settlement and structural distress.

8.1.2 Geotechnical Zone 2: ***H1/R or S/H1/R***

Founding in this zone can be done by means of reinforced strip footings. This method sees founding by means of reinforced strip footings capable of accommodating up to 15mm unrestrained heave and (where relevant) up to 10mm settlement. The superstructure is to contain articulation joints at all internal and external doors and openings, as well as lightly reinforced masonry. As before, care must be taken to remove all cobbles from the building footprints.

8.1.3 Geotechnical Zone 3: ***S1***

In this zone founding can be done by means of reinforced strip footings capable of accommodating up to 20mm compression settlement. Foundation pressures should not exceed 50kPa. The superstructure should contain articulation joints at all internal and external doors and openings, as well as lightly reinforced masonry. As before, care must be taken to remove all cobbles from the building footprints.

8.1.4 Geotechnical Zone 4: ***H1-H2 or S/H1-H2***

It is anticipated that founding in this zone may be done by means of a reinforced raft capable of accommodating up to 30mm unrestrained heave and foundation pressures not exceeding 50kPa. The raft must also be able to accommodate up to 10mm compression settlement. The superstructure must contain articulation joints and masonry must be lightly reinforced. Floor slabs must be fabric reinforced.

8.1.5 Geotechnical Zone 5: ***H3***

Founding in zone 5 must be done by means of a reinforced raft capable of accommodating unrestrained heave exceeding 30mm. The exact amount of heave must be determine for each stand during the phase 2 geotechnical investigation, but as a guideline, maximum unrestrained heave of up to 90mm is expected. The superstructure must contain articulation joints and masonry must be lightly reinforced. Floor slabs must be fabric reinforced.

As an alternative, a soil replacement raft may be considered, if economically viable.

8.1.6 General Remarks

Site drainage of this area must be planned carefully and no storm water or surface water should be allowed to accumulate within 1.5m of individual structures.

The anticipated soil movements, geotechnical zoning and proposed foundation precautions are summarised in the attached Table 5: Foundation Design, Building Procedures and Precautionary Measures. *It is essential that zoning and individual stand zoning be verified during a phase two geotechnical investigation in accordance with SANS634. Also, the zoning as discussed above may be altered based on the outcome of a flood line assessment and groundwater study.*

8.2 Conditions of Excavation

Considering the parameters of "Conditions of Excavation" as per SANS 1200, one must allow amongst others the following for the prevailing site conditions:

- *Colluvium and Ferruginised Colluvium:* All colluvial materials are considered machine or hand excavatible. Provision should be made for the excavation and removal of cobbles and for this reason hand excavation is not recommended.
- *Pedogenic Ferricrete Deposits:* The pedogenic materials are considered machine excavatible. Hand excavation is not recommended.
- *Residual Shale Materials:* The residual shale, calcified residual shale and ferruginised residual shale materials all proved to be machine excavatible. Due to the materials' consistency and composition, hand excavation is not recommended in this material and it is also recommended that provision be made for clayey excavation if materials are encountered in a moist to wet state.
- *Residual Sandstone:* The residual sandstone is considered partially machine excavatible as it grades into weathered bedrock. The use of larger excavation equipment (e.g. excavator) may be more effective when excavating through this material. Hand excavation is not recommended; however refusal of excavation is expected to occur despite using larger equipment.

TABLE 5 : FOUNDATION DESIGN, BUILDING PROCEDURES AND PRECAUTIONARY MEASURES

GEOTECHNICAL ZONE	GEOTECHNICAL CLASS	% OF TOTAL AREA	ESTIMATED SOIL MOVEMENT	SOIL PROFILE	DEVELOPMENT POTENTIAL	CONSTRUCTION TYPE	FOUNDATION DESIGN	ASSOCIATED PROBLEMS
1	**R or S/R**	44.1%	Less than 10mm settlement	Limited colluvium overlying bedrock	Favourable	Normal	Strip footings OR Slab on the ground	Bedrock outcrop Slaking shale Cobbles in overburden Corrosive soils Possible seasonal groundwater
2	**H1/R or S/H1/R**	28.1%	Up to 15mm unrestrained heave; less than 10mm settlement in places	Colluvium overlying residual soils with shallow bedrock in places	Favourable	Modified normal	Reinforced strip footings	Sporadic bedrock Corrosive soils Possible seasonal groundwater
3	**S1**	1.0%	Settlement of up to 20mm	Colluvium overlying residual shale	Intermediate	Modified normal	Reinforced strip footings	Corrosive soils Possible seasonal groundwater Sporadic occurrence
4	**H1-H2 or S/H1-H2**	10.6%	Unrestrained heave of up to 30mm; less than 10mm settlement in places	Colluvium overlying residual profile (mixed materials)	Intermediate	Modified	Reinforced raft	Corrosive soils Possible seasonal groundwater Risk of flooding Dispersive soils Erosion dongas
5	**H3**	16.2%	unrestrained heave exceeding 30mm	Variable; mostly colluvium overlying mixed residual soils.	Intermediate	Modified	Reinforced raft OR Soil replacement raft	Corrosive soils Possible seasonal groundwater Risk of flooding Dispersive soils Erosion dongas

- *Ferruginised Residual Sandstone:* The ferruginised residual sandstone should best be excavated using mechanical equipment and provision should be made for possible clayey excavation if the material is found in a moist to wet state.
- *Residual Dolerite and Ferruginised Residual Dolerite:* These materials proved excavatible by machine and should preferably not be excavated by hand due to its clayey consistency and the inclusion of cobble-sized corestones.
- *Shale Bedrock:* The shale bedrock is considered partially excavatible by backhoe and would be more so using an excavator. However the material is bound to induce refusal of mechanical excavation at some point. The bedrock varies from very soft rock material to potentially hard rock material where it has undergone contact or heat metamorphism. Blasting may be required in case of the latter scenario.
- *Sandstone Bedrock:* The sandstone bedrock materials have roughly similar properties to the shale bedrock as far as excavatibility is concerned.
- *Dolerite Bedrock:* The dolerite bedrock encountered in outcrop on site is considered very hard rock and will require blasting or chemical dissolution to remove.
- *Corestones:* The presence of dolerite corestones was proven during the investigation. The corestones were generally limited in size and could be managed by a skilled backhoe operator, though it is anticipated that some corestones may require larger excavation equipment to allow effective removal.
- *Excavation Stability:* Excavations made during the course of the investigation largely proved to be stable. It is expected that perched or seepage water – if present – will severely detract from the excavation stability and would necessitate remedial steps (e.g. pumping dry excavations).
- *Wet Excavation:* Depending on the outcome of a groundwater study, it may be required to make provision for wet excavation on a seasonal basis.
- *General Comments:* Excavation by backhoe proved viable to depths between 300mm and 2400mm; however areas of bedrock outcrop may not be excavatible. 23 of the 45 trial holes (i.e. 51%) achieved depths of 1500mm or deeper.
- *Slaking Mudrock*: In order to avoid a reduction in bedrock competence, it is recommended that shale (and to a lesser extent sandstone) bedrock exposed to atmospheric conditions should be exposed for the shortest time possible to prevent slaking.
- *Safety:* The safety of all persons working in or near open excavations must be ensured.

8.3 Seismicity

The guidelines of the National Housing Board [Reference 9.7] indicate the level of seismicity of the area to be within acceptable limits. In terms of seismicity the development potential of the area is regarded as favourable.

8.4 Soil Corrossivity

Provision must be made to protect metallic objects (e.g. services, utilities, anchoring cables, etc.) which are buried below ground level from corrosive soils and possible exposure to seasonal groundwater. It is recommended that protective coating be considered for piping. Alternatively, the use of PVC pipes may be considered.

All services must take into account the expansive nature of some in situ soils to avoid being damaged or disrupted by soil heave.

8.5 Other Recommendations

It is recommended that the following additional matters be considered and/or investigated:

- *Flood Lines:* It is essential that a flood line assessment be undertaken for this property to ensure that no stands are set out below the applicable flood line. Once this is available, the geotechnical zoning should also be revised accordingly. The flood line assessment should be supplemented by a wetland review to identify a suitable buffer to be devoid of development, where applicable.
- *Groundwater Study:* It is essential that a groundwater study be undertaken to assess the possibility, severity and extent of expected seasonal groundwater (i.e. perched water level) fluctuations. Based on the outcome of such a report, a decision must be taken whether additional measured (e.g. sub-surface drains, etc.) will be required to manage any seepage water.
- *Soil Erosion:* It is recommended that additional measures be put in place to arrest and secure erosion channels on the site. A civil engineering contractor can be approached in this regard to assess the severity of the problem and provide an engineering solution to the problem. Failing to arrest the erosion may see future propagation and expansion of erosion features which may encroach on the proposed development.

9 SOURCES OF REFERENCE

9.1 Mucina L. and Rutherford M.C. (eds): *The Vegetation of South Africa, Lesotho and Swaziland*, page 335, published in 2006 by SANBI

9.2 Vegter, J.R. (1995): *An Explanation of a Set of National Ground Water Maps*, published by the Water Research Commission.

9.3 Van der Merwe, D (1964).: *The Prediction of Heave from the Plasticity Index and Percentage Clay Fraction of Soils*, published in the Civil Engineer in South Africa, pages 103 to 107.

9.4 NHBRC (1999): *Home Building Manual Part 1 & 2*, Revision 1, page 18, published by the National Home Builders Registration Counsel, Pretoria.

9.5 Kijko A., Graham, G., Bejaichund, D.L., Roblin, D.L. and Brandt, M.B.C. (2003): *Probabilistic Peak Ground Acceleration and Spectral Seismic Hazard Maps for South Africa*, Report 2003-0053, Council for Geoscience.

9.6 Evans, U.R. (1971): *The Corrosion and Oxidation of Metals*, published by Edward Arnold.

9.7 National Department of Housing (2002): Geotechnical Site Investigations for Housing Developments – Generic Specifications GFSH-2, pages 9 and 10.

IJ Breytenbach (Pr. Sci. Nat.)
5 July 2017
For Soilkraft cc

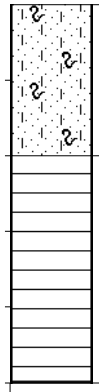
APPENDIX A: TRIAL HOLE LOG SHEETS

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 1
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark grey, medium dense, intact, silty sand containing mixed gravel fragments. Colluvium. Roots.

0.20 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.50

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 04.4S
Y-COORD : 29° 43 34.7E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

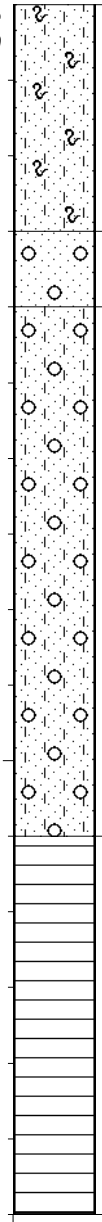
HOLE No: 1
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 2
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark grey, medium dense, intact, silty sand containing mixed gravel fragments. Colluvium. Roots.

0.30 Dry, grey mottled orange, medium dense, intact, gravelly sand. Ferruginised colluvium.

0.40 Slightly moist to dry, light grey, medium dense, intact, gravelly silty sand. Residual shale.

SKT-42-262:

1.10 Dark grey brown, fine grained, moderately to highly weathered, very closely jointed, very soft to soft rock: shale. Material resembles gravel in places.

1.60

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-262: 0.70m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 08.0S
Y-COORD : 29° 43 32.1E

HOLE No: 2
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

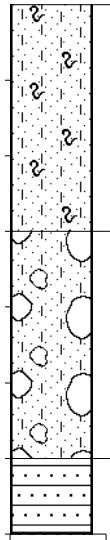
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 3
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark grey, medium dense, intact, silty sand containing mixed gravel fragments. Colluvium. Roots.

0.30 Moist, dark brown, medium dense, intact, silty sand containing cobbles of sandstone . Colluvium.

0.60 Light grey, fine grained, partially laminated, moderately weathered, closely jointed, soft to medium hard rock: slightly baked sandstone. Black discolourations along joints.

0.70

NOTES

1) Gradual refusal of excavation.

2) No seepage.

3) Bedrock outcrop in immediate vicinity.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 09.7S
Y-COORD : 29° 43 27.8E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

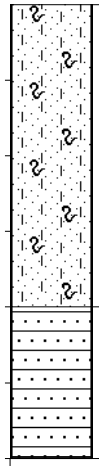
HOLE No: 3
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 4
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark brown, loose, intact, silty sand containing scattered gravel fragments. Colluvium. Roots.

0.40 Light grey, fine grained, partially laminated, moderately weathered, closely jointed, soft to medium hard rock: slightly baked sandstone. Black discolourations along joints.

0.60

NOTES

1) Refusal of excavation.

2) No seepage.

3) Ant hills in vicinity of trial hole.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 11.7S
Y-COORD : 29° 43 24.4E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

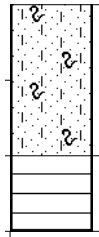
HOLE No: 4
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 5
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark grey, medium dense, intact, silty sand containing mixed gravel fragments. Colluvium. Roots.

0.20 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.30

NOTES

1) Refusal of excavation.

2) No seepage.

3) Slaking mudrock in outcrop nearby.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 10.0S
Y-COORD : 29° 43 34.2E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

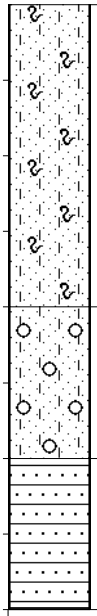
HOLE No: 5
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 6
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



SKT-42-263:

0.00 Dry, dark grey, medium dense, intact, silty sand containing mixed gravel fragments. Colluvium. Roots.

0.40 Slightly moist, grey mottled orange, medium dense, intact, gravelly silty sand. Ferruginised colluvium.

0.60 Light grey, fine grained, partially laminated, moderately weathered, closely jointed, soft to medium hard rock: slightly baked sandstone. Black discolourations along joints.

0.80

NOTES

1) Gradual refusal of excavation.

2) No seepage.

3) Disturbed Sample SKT-42-263: 0.20m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 13.5S
Y-COORD : 29° 43 31.4E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

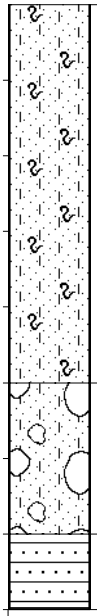
HOLE No: 6
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 7
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark brown, loose, intact, silty sand containing scattered gravel fragments. Colluvium. Roots.

0.50 Moist, dark brown, medium dense, intact, silty sand containing sandstone cobbles. Colluvium.

0.70 Light grey, fine grained, partially laminated, moderately weathered, closely jointed, soft to medium hard rock: slightly baked sandstone. Black discolourations along joints.

0.80

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 14.9S
Y-COORD : 29° 43 26.5E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

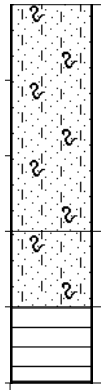
HOLE No: 7
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 8
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00	Moist, light grey, loose, intact, silty sand. Colluvium. Roots.
0.30	Moist, light grey, loose, intact, silty sand containing ferruginised sandstone fragments. Ferruginised colluvium. Roots.
0.40	Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.
0.50	

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 29° 39 16.5S
Y-COORD : 29° 43 22.2E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

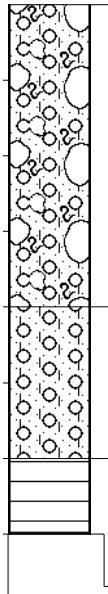
HOLE No: 8
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 9
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Slightly moist to wet, light grey, loose, intact, silty sand containing sandstone gravel and cobbles. Colluvium. Roots.

0.40 Moist, light grey, very loose, intact, silty sand containing sandstone and shale gravel fragments. Colluvium.

0.60 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.70

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 18.5S
Y-COORD : 29° 43 16.8E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

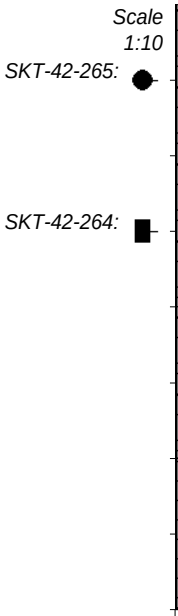
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

HOLE No: 9
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 10
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS



0.00 — Slightly moist to wet, light grey, loose, intact, silty sand containing sandstone gravel and cobbles. Colluvium. Roots.

0.40 — Moist, dark brown mottled orange, medium dense, voided, silty sand containing shale cobbles. Ferruginised colluvium.

0.60 — Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.80

NOTES

1) Refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-265: 0.10m.
4) Undisturbed Sample SKT-42-264: 0.30m.
5) Erosion dongas adjacent to trial hole

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 19.8S
Y-COORD : 29° 43 13.4E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

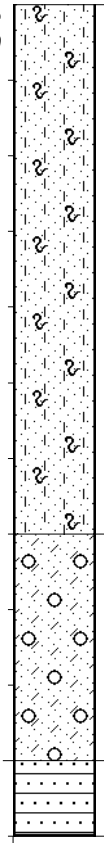
HOLE No: 10
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 11
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark grey brown, loose, intact, silty sand. Colluvium. Roots.

0.70 Moist, dark brown mottled black and orange, dense, intact, clayey gravelly sand. Nodular ferricrete.

1.00 Light grey, fine grained, partially laminated, moderately weathered, closely jointed, soft to medium hard rock: slightly baked sandstone. Black discolourations along joints.

1.10

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 22.7S
Y-COORD : 29° 43 08.9E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

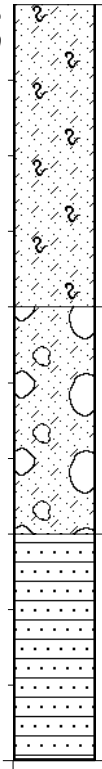
HOLE No: 11
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 12
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark grey, medium dense, shattered, clayey sand. Colluvium. Roots.

0.40 Slightly moist, dark grey mottled pale orange, medium dense, shattered, clayey sand containing shale fragments and sandstone cobbles. Ferruginised residual shale.

0.70 Grey brown, fine to very fine grained, slightly to moderately weathered, massive, soft to very soft rock: sandstone.

1.00

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 23.6S
Y-COORD : 29° 43 16.8E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

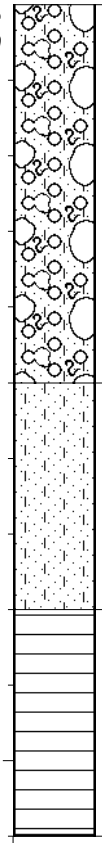
HOLE No: 12
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 13
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Slightly moist to wet, light grey, loose, intact, silty sand containing sandstone gravel and cobbles. Colluvium. Roots.

0.50 Moist, dark brown mottled orange, medium dense, voided, silty sand. Ferruginised colluvium.

0.80 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

1.10

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 22.2S
Y-COORD : 29° 43 20.6E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

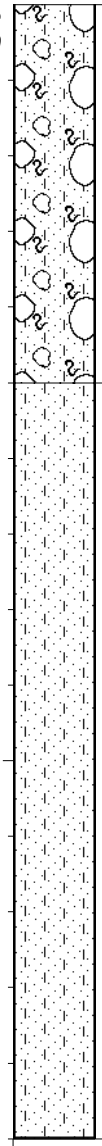
HOLE No: 13
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 14
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, light grey, loose, intact, silty sand containing scattered sandstone cobbles. Colluvium. Roots.

0.50 Very moist, grey yellow, loose, intact, silty sand containing shale fragments . Residual shale.

SKT-42-266:

1.50

NOTES

1) Instant refusal on dark brown micaceous sandstone.
2) No seepage.
3) Disturbed Sample SKT-42-266: 1.00m.
4) Ants nest in soil profile.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 19.8S
Y-COORD : 29° 43 24.9E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

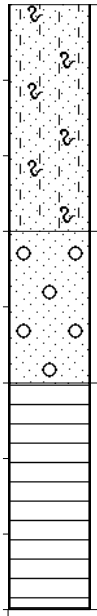
HOLE No: 14
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 15
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark grey, loose, intact, silty sand. Colluvium. Roots.

0.30 Moist, grey mottled orange, medium dense, intact, gravelly sand. Ferruginised colluvium.

0.50 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.80

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 18.4S
Y-COORD : 29° 43 30.1E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

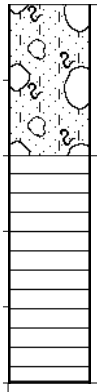
HOLE No: 15
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 16
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, light grey, loose, intact, silty sand containing scattered sandstone cobbles. Colluvium. Roots.

0.20 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.50

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 23.6S
Y-COORD : 29° 43 28.4E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

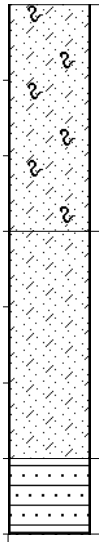
HOLE No: 16
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 17
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00	Slightly moist, dark grey, medium dense, shattered, clayey sand. Colluvium. Roots.
0.30	Moist, dark brown, loose, shattered, clayey sand containing shale gravel and cobbles , as well as ferricrete nodules. Ferruginised colluvium.
0.60	Dark brown, fine grained, slightly weathered, partially laminated, massive, soft to medium hard rock: micaceous sandstone.
0.70	

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 26.5S
Y-COORD : 29° 43 28.2E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

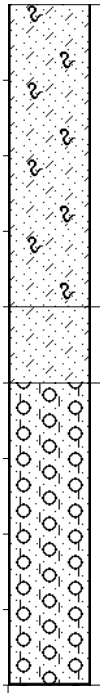
HOLE No: 17
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 18
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark grey, medium dense, shattered, clayey sand. Colluvium. Roots.

0.40 Slightly moist, dark grey mottled pale orange, medium dense, shattered, clayey sand containing shale fragments. Ferruginised residual shale.

0.50 Slightly moist, light grey, dense, intact, silty sand containing shale gravel. Residual shale grading into bedrock.

SKT-42-267:

0.90

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-267: 0.70m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 25.4S
Y-COORD : 29° 43 23.7E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

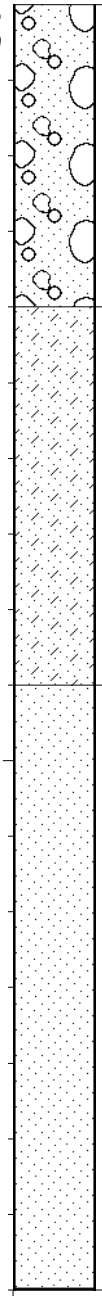
HOLE No: 18
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 19
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 — Moist, dark brown mottled orange and black, medium dense, intact, gravelly silty sand containing abundant dolerite gravel and cobbles. Ferruginised colluvium.

0.40 — Very moist, dark orange blotched brown speckled black, medium dense, intact, clayey sand. Ferruginised residual sandstone.

SKT-42-268: 0.65

0.90 — Very moist, dark grey brown, medium dense becoming dense with depth, intact, micaceous sand. Residual sandstone grading into weathered bedrock.

1.70

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-268: 0.65m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 27.7S
Y-COORD : 29° 43 15.8E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

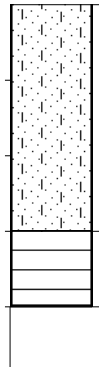
HOLE No: 19
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 20
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Very moist, dark brown mottled orange and black, loose, intact, silty sand. Ferruginised colluvium.

0.30 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked micaceous shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

0.40

NOTES

1) Refusal of excavation.

2) No seepage.

3) Sandstone outcrop in immediate vicinity of trial hole.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 30.4S
Y-COORD : 29° 43 22.5E

HOLE No: 20
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

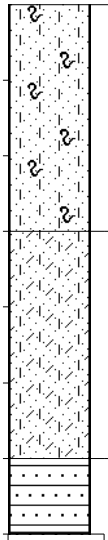
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 21
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00	Very moist, dark brown, very loose, intact, silty sand. Colluvium. Roots.
0.30	Very moist, light grey brown mottled orange, very loose, intact, clayey silty sand. Ferruginised colluvium.
0.60	Light grey, very fine to fine grained, slightly to moderately weathered, massive, very soft to soft rock: micaceous sandstone.
0.70	

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 32.5S
Y-COORD : 29° 43 26.5E

HOLE No: 21
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

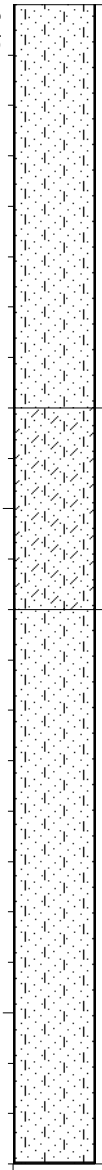
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 22
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Very moist, light grey, very loose, intact, silty sand. Colluvium.

SKT-42-269:

0.80 Very moist, light grey blotched orange mottled black, medium dense, intact, clayey silty sand. Ferruginised residual sandstone.

1.20 Very moist, orange brown blotched grey mottled black, medium dense, intact, silty sand. Ferruginised residual sandstone.

SKT-42-270:

2.30

NOTES

1) No refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-270: 1.75m.
4) Undisturbed Sample SKT-42-269: 0.40m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 36.7S
Y-COORD : 29° 43 25.6E

HOLE No: 22
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

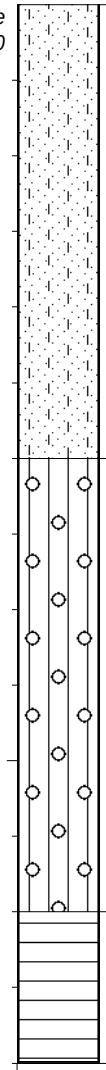
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 23
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Very moist, dark brown mottled orange and black, loose, intact, silty sand. Ferruginised colluvium.

0.60 Moist, light grey, firm to stiff, partially laminated, gravelly silt. Residual shale containing localised lenses of clay .

1.20 Light grey, fine grained, partially laminated, closely jointed, slightly weathered, medium hard to hard rock: baked shale. Joints are undulating to rough, open (less than 1mm) and discoloured black.

1.40

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 35.6S
Y-COORD : 29° 43 20.6E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

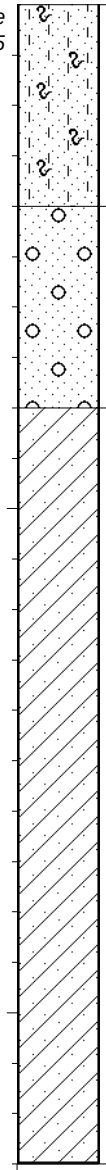
HOLE No: 23
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 24
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Dry, dark brown, medium dense, intact, silty sand. Colluvium. Roots.

0.40 Dry, orange mottled black, dense, intact, gravelly sand. Ferruginised colluvium.

0.80 Dry, light grey blotched white, very stiff, slickensided, sandy clay containing sandstone fragments. Residual sandstone.

2.30

NOTES

1) No refusal of excavation.
2) No seepage.
3) Eucalyptus trees adjacent to trial hole.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

ELEVATION :
X-COORD : 28° 39 38.9S
Y-COORD : 29° 43 23.1E

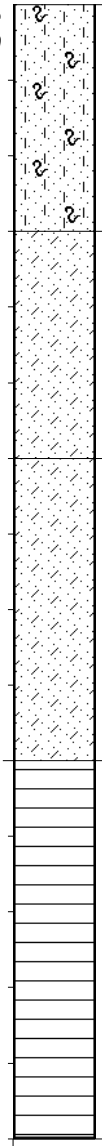
HOLE No: 24
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 25
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, dark brown, medium dense, intact, silty sand. Colluvium. Roots.

0.30 Dry, orange mottled black, dense, intact, clayey sand. Ferruginised colluvium.

0.60 Slightly moist, brown grey, dense, slickensided, clayey sand. Residual shale.

SKT-42-271:

1.00 Dark green grey, very fine grained, slightly weathered, closely to medium jointed, soft to very soft rock: shale.

1.50

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-271: 0.80m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 43.4S
Y-COORD : 29° 43 23.4E

HOLE No: 25
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

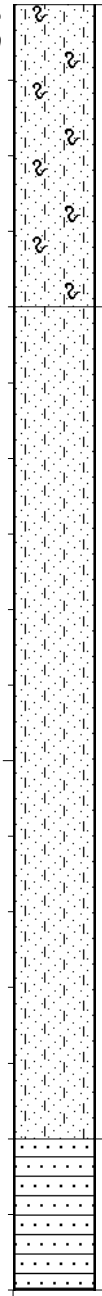
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 26
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark grey brown, medium dense to dense, intact, silty sand. Colluvium. Roots.

0.40 Moist, orange grey mottled black, dense, intact, silty sand. Ferruginised residual sandstone.

SKT-42-272:

1.50 Grey white, fine grained, highly weathered, massive, soft to very soft rock: sandstone.

1.70

NOTES

1) Refusal of excavation.

2) No seepage.

3) Disturbed Sample SKT-42-272: 0.95m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 29.7S
Y-COORD : 29° 43 11.5E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

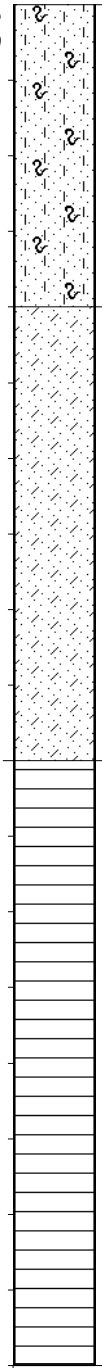
HOLE No: 26
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 27
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, light grey, very loose, intact, silty sand. Colluvium. Roots.

0.40 Slightly moist, dark grey blotched orange, dense, slickensided, clayey sand. Ferruginised residual shale.

1.00 Dark grey, laminated, very fine grained, highly weathered, massive, very soft rock: micaceous shale.

1.80

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 33.4S
Y-COORD : 29° 43 13.6E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

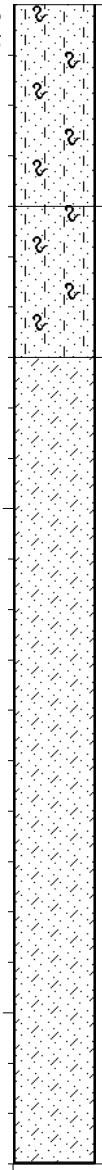
HOLE No: 27
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 28
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Dry, dark grey, very loose, intact, silty sand. Colluvium. Roots.

0.40 Moist, light grey, very loose, intact, silty sand. Colluvium. Roots.

0.70 Slightly moist, dark grey blotched orange, dense, slickensided, clayey sand. Ferruginised residual shale.

2.30

NOTES

1) No refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-273: 1.50m.
4) Eucalyptus trees adjacent to trial hole.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 37.5S
Y-COORD : 29° 43 15.7E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

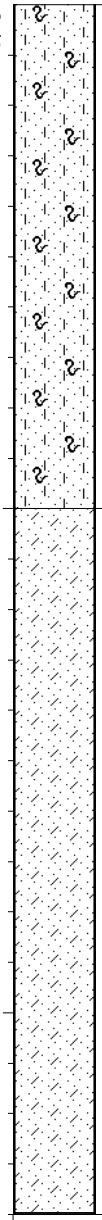
HOLE No: 28
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 29
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Moist, light grey, very loose, intact, silty sand. Colluvium. Roots.

1.00 Slightly moist, dark grey blotched orange speckled black, dense, slickensided, clayey sand. Ferruginised residual shale.

2.40

NOTES

1) No refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

ELEVATION :
X-COORD : 28° 39 44.1S
Y-COORD : 29° 43 19.5E

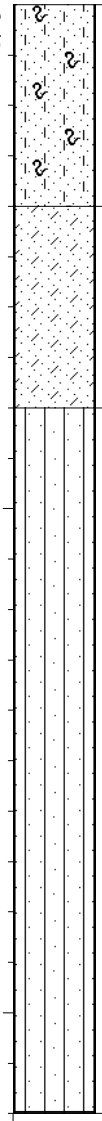
HOLE No: 29
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 30
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Moist, light grey, very loose, intact, silty sand. Colluvium. Roots.

0.40 Very moist, dark brown, medium dense, shattered, clayey sand. Colluvium.

SKT-42-274:

0.80 Very moist, dark grey mottled black and orange, firm, intact, sandy silt. Residual shale.

2.20

NOTES

1) No refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-274: 0.60m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 44.3S
Y-COORD : 29° 43 11.8E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

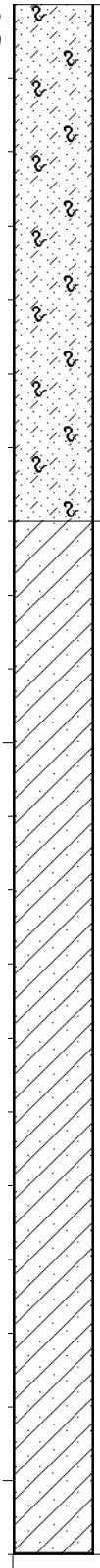
HOLE No: 30
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 31
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, light grey brown, loose, intact, clayey sand. Colluvium. Roots.

0.70 Very moist, light brown grey mottled orange speckled black, stiff, slickensided, sandy clay. Ferruginised residual shale.

2.10

NOTES

1) No refusal of excavation.
2) No seepage.
3) Shale bedrock at the base of trial hole.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 46.6S
Y-COORD : 29° 43 09.8E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

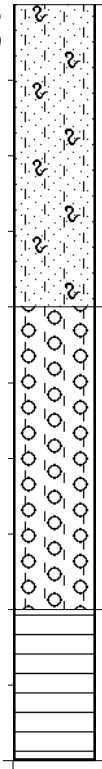
HOLE No: 31
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 32
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, light grey brown, loose, intact, silty sand. Colluvium. Roots.

0.40 Very moist, grey brown, loose, intact, silty gravel. Residual shale.

0.80 Dark grey, very fine grained, laminated, closely jointed, slightly weathered, soft to medium hard rock: shale. Joints are discoloured black.

1.00

NOTES

1) Refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 44.7S
Y-COORD : 29° 43 07.7E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

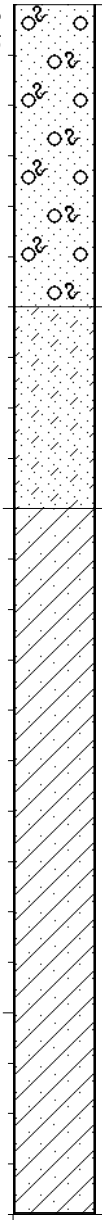
HOLE No: 32
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 33
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



SKT-42-275:

0.00 Very moist, light yellow brown, loose, intact, gravelly sand. Colluvium. Roots.

0.60 Very moist, dark brown mottled white, medium dense, intact, clayey sand. Colluvium.

1.00 Very moist, light brown grey mottled orange speckled black, stiff, sandy clay. Ferruginised residual shale.

2.40

NOTES

1) No refusal of excavation.

2) No seepage.

3) Disturbed Sample SKT-42-275: 0.30m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 45.1S
Y-COORD : 29° 43 04.2E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

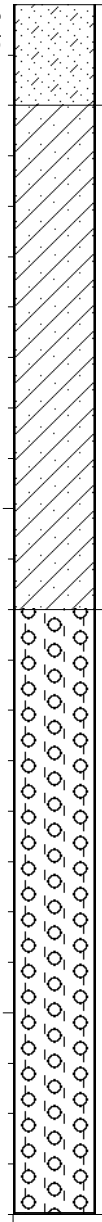
HOLE No: 33
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 34
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Dry, dark brown mottled black, dense, shattered, clayey sand containing ferricrete nodules. Ferruginised residual shale.

0.20 Slightly moist, light grey blotched white, stiff, slickensided, sandy clay. Calcified residual shale.

1.20 Dry, light grey, dense, laminated, silty gravel. Residual sandstone grading into micaceous bedrock.

2.40

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 42.2S
Y-COORD : 29° 43 02.6E

HOLE No: 34
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

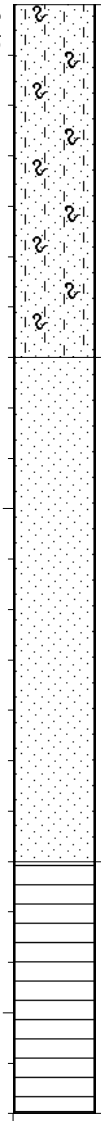
DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 35
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Moist, light grey brown, loose, intact, silty sand. Colluvium. Roots.

0.70 Very moist, orange blotched brown speckled black, dense, intact, clayey sand. Ferruginised residual sandstone.

1.70 Dark grey, very fine grained, laminated, closely jointed, slightly weathered, soft to medium hard rock: shale. Joints are discoloured black.

2.20

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-276: 0.35m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 40.4S
Y-COORD : 29° 43 06.4E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

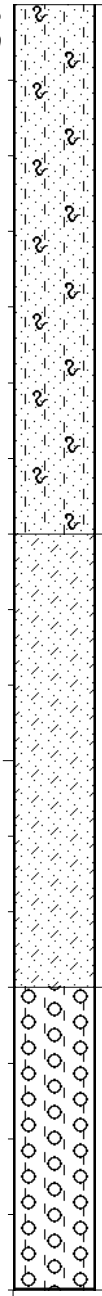
HOLE No: 35
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 36
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, light grey, very loose, intact, silty sand. Colluvium. Roots.

0.70 Slightly moist, dark grey blotched orange, dense, slickensided, clayey sand. Ferruginised residual shale.

1.30 Dry, light grey, dense, laminated, silty gravel. Residual sandstone grading into micaceous bedrock.

1.70

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 39.1S
Y-COORD : 29° 43 11.5E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

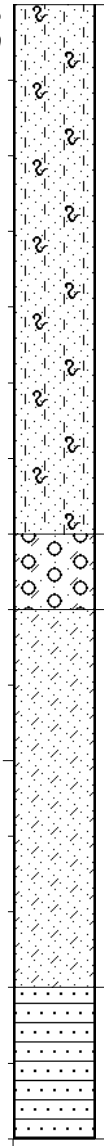
HOLE No: 36
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 37
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, grey brown, very loose, intact, silty sand. Colluvium. Roots.

0.70 Very moist, dark brown mottled black and orange, loose, shattered, clayey sandy gravel. Nodular ferricrete.

0.80 Slightly moist, dark grey blotched orange, medium dense, slickensided, clayey sand. Ferruginised residual shale.

1.30 Light brown grey, fine grained, massive, moderately weathered, laminated, very soft to soft rock: micaceous sandstone.

1.50

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Dolerite outcrop nearby

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 35.7S
Y-COORD : 29° 43 09.1E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

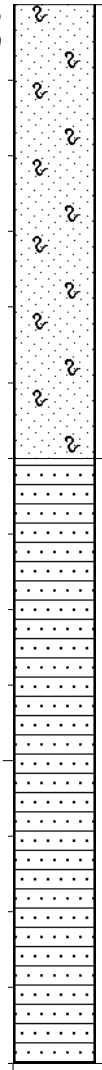
HOLE No: 37
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 38
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Dry, light grey, dense, intact, sand. Colluvium. Roots.

0.60 Alternating light and dark grey, fine grained, moderately weathered, laminated, massive, very soft to soft rock: micaceous sandstone.

1.40

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 37.4S
Y-COORD : 29° 43 04.9E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

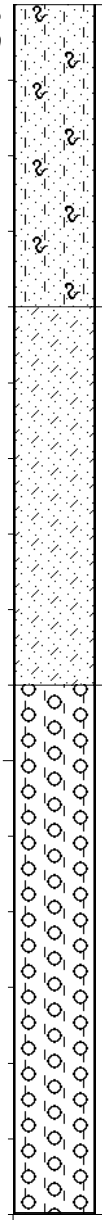
HOLE No: 38
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 39
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark grey, very loose, intact, silty sand. Colluvium. Roots.

0.40 Moist, orange blotched grey mottled black, medium dense, intact, clayey sand. Ferruginised residual micaceous sandstone.

SKT-42-277:

0.90 Dry, light grey, dense, laminated, silty gravel. Residual sandstone grading into micaceous bedrock.

1.60

NOTES

1) Gradual refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-277: 0.65m.
4) Trial hole near contact with dolerite.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 38.0S
Y-COORD : 29° 43 01.1E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

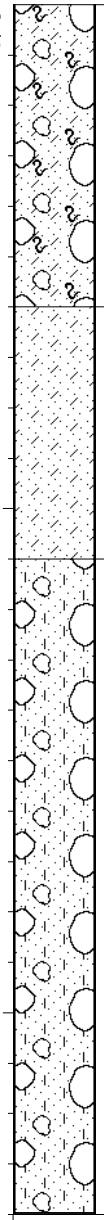
HOLE No: 39
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 40
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:15



0.00 Moist, dark brown, medium dense, shattered, clayey sand containing dolerite cobbles. Colluvium. Roots.

0.60 Moist, orange brown speckled black, medium dense, intact, clayey sand. Ferruginised residual dolerite.

1.10 Moist, brown yellow, loose to medium dense, intact, silty sand containing cobbles (corestones). Residual dolerite.

2.40

NOTES

1) No refusal of excavation.
2) No seepage.
3) Disturbed Sample SKT-42-278: 1.75m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 34.5S
Y-COORD : 29° 42 59.5E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

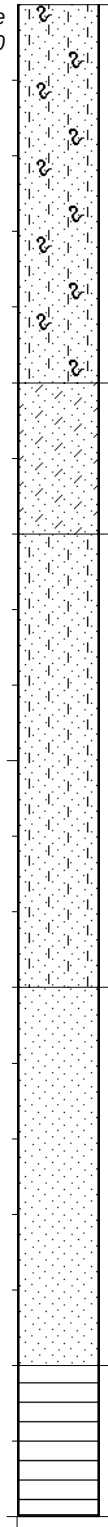
HOLE No: 40
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 41
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00	Moist, dark grey brown, loose, intact, silty sand. Colluvium. Roots.
0.50	Moist, dark brown mottled black and orange, dense, intact, clayey sand. Ferruginised colluvium.
0.70	Moist, orange grey mottled black, dense, intact, silty sand. Ferruginised residual sandstone.
1.30	Slightly moist, white grey, dense, laminated, sand. Residual sandstone.
1.80	Dark grey brown, very fine grained, slightly weathered, massive, laminated, very soft rock: micaceous shale.
2.00	

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 32.8S
Y-COORD : 29° 43 03.1E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

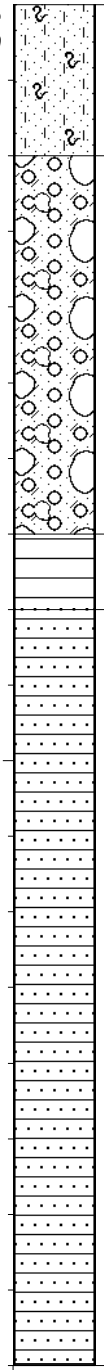
HOLE No: 41
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 42
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark grey brown, loose, intact, silty sand. Colluvium. Roots.

0.20 Moist, grey brown blotched white and orange, dense, intact, clayey sand containing sandstone gravel and cobbles. Ferruginised colluvium.

0.70 Dark grey, very fine grained, laminated, highly weathered, massive, very soft rock: shale.

0.80 Grey white and orange brown, laminated, fine grained, highly weathered, massive, very soft rock: micaceous sandstone. Bedrock tends to residual material in places.

1.80

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 31.0S
Y-COORD : 29° 43 07.9E

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

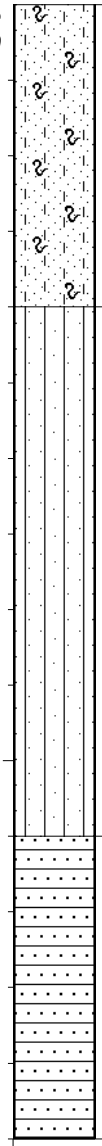
HOLE No: 42
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 43
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00 Moist, dark grey brown, loose, intact, silty sand. Colluvium. Roots.

0.40 Moist, dark orange blotched dark brown, soft, intact, sandy silt. Ferruginised residual shale.

1.10 Yellow brown, fine grained, partially laminated, moderately weathered, closely jointed, soft to medium hard rock: slightly baked sandstone. Black discolourations along joints.

1.50

NOTES

1) Gradual refusal of excavation.

2) No seepage.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

ELEVATION :
X-COORD : 28° 39 27.3S
Y-COORD : 29° 43 05.8E

HOLE No: 43
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 44
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale
1:10

0.00
0.00

Area of dolerite outcrop forming a rocky ridge.

NOTES

1) Position not accessible to backhoe.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : 700mm
DATE :
DATE : 06/06/2017

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

ELEVATION :
X-COORD : 28° 39 28.0S
Y-COORD : 29° 43 00.8E

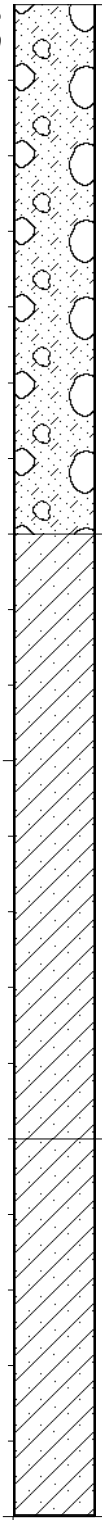
HOLE No: 44
Geotechnical Investigation

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

HOLE No: 45
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

Scale 1:10



0.00

Moist, dark brown, medium dense, shattered, clayey sand with abundant dolerite cobbles. Colluvium.

0.70

Very moist, dark red, soft, intact, sandy clay. Residual dolerite.

SKT-42-279:

1.50

Very moist, light grey brown, soft to firm, intact, sandy clay. Residual dolerite containing scattered corestones.

2.00

NOTES

1) Refusal of excavation on dolerite corestones.

2) No seepage.

3) Disturbed Sample SKT-42-279: 1.05m.

CONTRACTOR : -
MACHINE : Cat 428F
DRILLED BY : Snake
PROFILED BY : Izak Breytenbach

INCLINATION :
DIAM : 700mm
DATE :
DATE : 07/06/2017

ELEVATION :
X-COORD : 28° 39 30.2S
Y-COORD : 29° 42 57.5E

HOLE No: 45
Geotechnical Investigation

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

SSS Invest (Pty) Ltd
Proposed Roosboom Extension One

LEGEND
Sheet 1 of 1

JOB NUMBER: 2017/J026/SSS

	GRAVEL	{SA02}
	GRAVELLY	{SA03}
	SAND	{SA04}
	SANDY	{SA05}
	SILT	{SA06}
	SILTY	{SA07}
	CLAY	{SA08}
	CLAYEY	{SA09}
	SANDSTONE	{SA11}
	SHALE	{SA12}
	DOLERITE	{SA18}{SA42}
Name	UNDISTURBED SAMPLE	{SA37}
Name	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}
	COBBLES	{SA58}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : Izak Breytenbach
SETUP FILE : STANDARD.SET

DATE : 05/07/2017 11:08
TEXT : ..\Roosboom\TPProfiles.txt

LEGEND
SUMMARY OF SYMBOLS

APPENDIX B: MATERIAL TEST RESULTS

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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 30-Jun-17
Method: SANS 3001 GR1, GR10, GR20, GR30, GR31, GR40, GR50, GR53, GR54 & ASTM D422 * (where applicable)

SUMMARY OF TEST DATA

Grading & Hydrometer Analysis (% Passing)

Sample	TH 2	TH 6	TH 10	TH 14	TH 18	TH 19	TH 22	TH 25
Depth (mm)	400 - 1100	0 - 400	0 - 400	500 - 1500	500 - 900	400 - 900	1200 - 2300	600 - 1000
Lab No	SKT-42-262	SKT-42-263	SKT-42-265	SKT-42-266	SKT-42-267	SKT-42-268	SKT-42-270	SKT-42-271
53.0	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
37.5	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
26.5	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
19.0	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
13.2	**99**	**99**	**100**	**100**	**100**	**100**	**100**	**100**
9.5	**96**	**97**	**100**	**100**	**100**	**100**	**100**	**100**
6.7	**92**	**94**	**99**	**96**	**97**	**100**	**100**	**100**
4.75	**87**	**91**	**97**	**94**	**94**	**100**	**99**	**100**
2.00	**75**	**81**	**90**	**89**	**83**	**99**	**98**	**99**
1.00	**70**	**77**	**87**	**88**	**79**	**98**	**97**	**97**
0.425	**66**	**75**	**86**	**86**	**77**	**97**	**88**	**92**
0.250	**64**	**73**	**83**	**84**	**75**	**81**	**70**	**83**
0.150	**56**	**67**	**75**	**72**	**71**	**61**	**56**	**74**
0.075	**41**	**48**	**52**	**48**	**61**	**41**	**40**	**59**
0.050	**20**	**20**	**31**	**20**	**41**	**34**	**28**	**48**
0.020	**16**	**15**	**22**	**13**	**31**	**30**	**21**	**42**
0.006	**12**	**11**	**12**	**7**	**22**	**24**	**19**	**39**
0.002	**10**	**8**	**7**	**4**	**16**	**21**	**18**	**36**
GM	**1.18**	**0.96**	**0.72**	**0.77**	**0.79**	**0.63**	**0.74**	**0.50**

Atterberg Limits

LL (%)	**25**	**21**	**0**	**23**	**35**	**32**	**30**	**50**
PI (%)	**8**	**4**	**SP**	**5**	**15**	**17**	**17**	**30**
LS (%)	**3.7**	**1.9**	**0.9**	**2.7**	**6.9**	**7.3**	**7.5**	**12.7**

pH & Conductivity

pH	**6.9**		**7.6**	**7.9**			**7.3**	**7.6**
EC (S/m)	**0.0132**		**0.0103**	**0.0109**			**0.0093**	**0.0424**

MDD / OMC

MDD (kg/m³)								
OMC (%)								

CBR

100%								
98%								
97%								
95%								
93%								
90%								
Swell (%)								

UCS (MPa)

100%								
97%								
90%								

COLTO Classification

Remarks: _____

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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 30-Jun-17
Method: SANS 3001 GR1, GR10, GR20, GR30, GR31, GR40, GR50, GR53, GR54 & ASTM D422 * (where applicable)

SUMMARY OF TEST DATA

Grading & Hydrometer Analysis (% Passing)

Sample	TH 26	TH 28	TH 30	TH 33	TH 35	TH 39	TH 40	TH 45
Depth (mm)	400 - 1500	700 - 2300	400 - 800	0 - 600	0 - 700	400 - 900	1100 - 2400	700 - 1500
Lab No	SKT-42-272	SKT-42-273	SKT-42-274	SKT-42-275	SKT-42-276	SKT-42-277	SKT-42-278	SKT-42-279
53.0	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
37.5	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
26.5	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
19.0	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
13.2	**100**	**100**	**100**	**100**	**100**	**100**	**99**	**100**
9.5	**100**	**100**	**100**	**100**	**100**	**99**	**98**	**100**
6.7	**100**	**100**	**100**	**100**	**100**	**97**	**97**	**100**
4.75	**100**	**98**	**99**	**98**	**100**	**95**	**96**	**100**
2.00	**99**	**94**	**95**	**88**	**100**	**92**	**93**	**99**
1.00	**98**	**93**	**87**	**83**	**99**	**88**	**88**	**99**
0.425	**94**	**87**	**80**	**77**	**90**	**63**	**80**	**99**
0.250	**82**	**73**	**76**	**65**	**72**	**54**	**77**	**95**
0.150	**63**	**63**	**70**	**42**	**56**	**47**	**70**	**90**
0.075	**46**	**55**	**58**	**27**	**35**	**41**	**61**	**81**
0.050	**31**	**42**	**42**	**17**	**14**	**35**	**39**	**56**
0.020	**25**	**37**	**38**	**14**	**11**	**31**	**31**	**47**
0.006	**20**	**31**	**31**	**11**	**7**	**26**	**26**	**41**
0.002	**18**	**28**	**27**	**10**	**5**	**24**	**23**	**37**
GM	**0.61**	**0.64**	**0.67**	**1.08**	**0.75**	**1.04**	**0.66**	**0.21**

Atterberg Limits

LL (%)	**31**	**46**	**32**	**20**	**17**	**24**	**50**	**69**
PI (%)	**17**	**27**	**16**	**4**	**3**	**5**	**24**	**36**
LS (%)	**7.7**	**11.8**	**6.9**	**2.7**	**1.7**	**3.0**	**9.8**	**15.7**

pH & Conductivity

pH		**7.1**			**6.5**	**7.0**	**6.8**	**7.1**
EC (S/m)		**0.0472**			**0.0061**	**0.0071**	**0.0453**	**0.0249**

MDD / OMC

MDD (kg/m³)								
OMC (%)								

CBR

100%								
98%								
97%								
95%								
93%								
90%								
Swell (%)								

UCS (MPa)

100%								
97%								
90%								

COLTO Classification

Remarks: _____

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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

FOUNDATION INDICATOR

Grading & Hydrometer Analysis (Particle Size (mm) & % Passing)				Atterberg Limits & Classification			
Sample	TH 2	TH 6	TH 10	Sample	TH 2	TH 6	TH 10
Depth (mm)	400 - 1100	0 - 400	0 - 400	Depth (mm)	400 - 1100	0 - 400	0 - 400
Lab No	SKT-42-262	SKT-42-263	SKT-42-265	Lab No	SKT-42-262	SKT-42-263	SKT-42-265
75.0	**100**	**100**	**100**	Liquid Limit (%)	**25**	**21**	**0**
63.0	**100**	**100**	**100**	Plastic Limit (%)	**17**	**17**	**0**
53.0	**100**	**100**	**100**	Plasticity Index (%)	**8**	**4**	**SP**
37.5	**100**	**100**	**100**	Linear Shrinkage (%)	**3.7**	**1.9**	**0.9**
26.5	**100**	**100**	**100**	PI of whole sample	**5**	**3**	**0**
19.0	**100**	**100**	**100**				
13.2	**99**	**99**	**100**	% Gravel	**25**	**19**	**10**
9.5	**96**	**97**	**100**	% Sand	**47**	**50**	**51**
6.7	**92**	**94**	**99**	% Silt	**18**	**23**	**32**
4.75	**87**	**91**	**97**	% Clay	**10**	**8**	**7**
2.00	**75**	**81**	**90**	Activity	**0.8**	**0.5**	**0.0**
1.00	**70**	**77**	**87**				
0.425	**66**	**75**	**86**	% Soil Mortar	**75**	**81**	**90**
0.250	**64**	**73**	**83**				
0.150	**56**	**67**	**75**	Grading Modulus	**1.18**	**0.96**	**0.72**
0.075	**41**	**48**	**52**	Moisture Content (%)	**N / T**	**N / T**	**N / T**
0.050	**20**	**20**	**31**	Relative Density (SG)*	**2.65**	**2.65**	**2.65**
0.020	**16**	**15**	**22**				
0.006	**12**	**11**	**12**	Unified (ASTM D2487)	**SC-SM**	**SM**	**ML**
0.002	**10**	**8**	**7**	AASHTO (M145-91)	**A - 4**	**A - 4**	**A - 4**

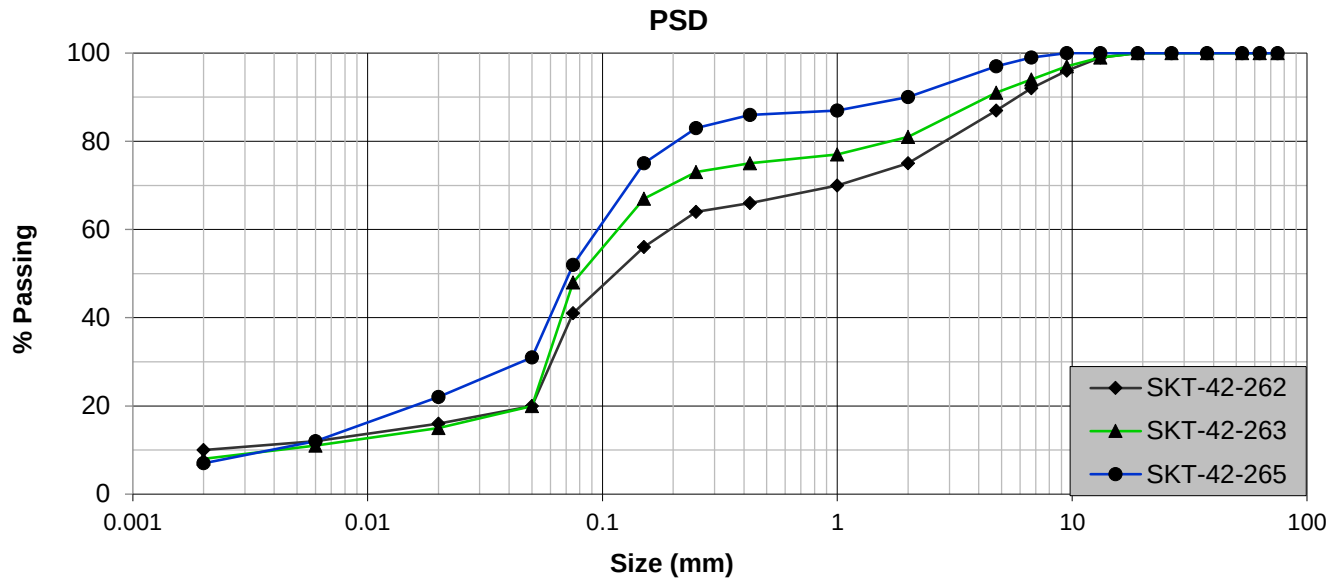
Remarks: *: Assumed
N / T: Not Tested

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

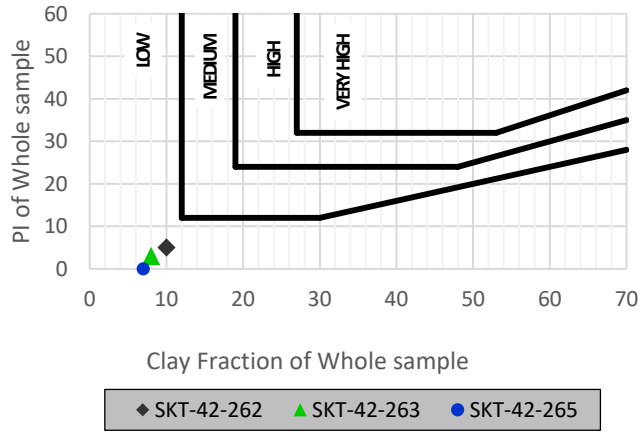
Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

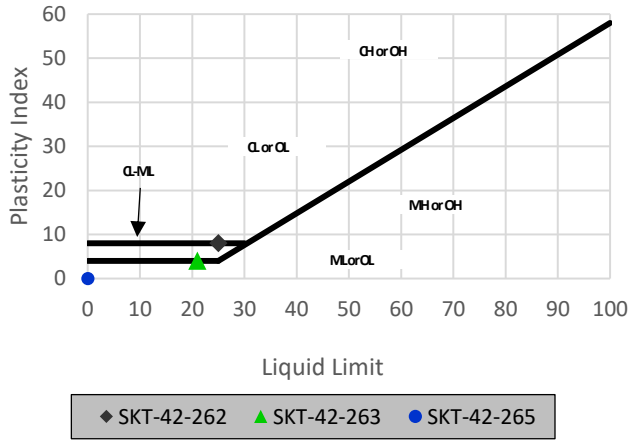
FOUNDATION INDICATOR



Potential Expansiveness



Casagrande Plasticity Chart



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

FOUNDATION INDICATOR

Grading & Hydrometer Analysis (Particle Size (mm) & % Passing)				Atterberg Limits & Classification			
Sample	TH 14	TH 18	TH 19	Sample	TH 14	TH 18	TH 19
Depth (mm)	500 - 1500	500 - 900	400 - 900	Depth (mm)	500 - 1500	500 - 900	400 - 900
Lab No	SKT-42-266	SKT-42-267	SKT-42-268	Lab No	SKT-42-266	SKT-42-267	SKT-42-268
75.0	**100**	**100**	**100**	Liquid Limit (%)	**23**	**35**	**32**
63.0	**100**	**100**	**100**	Plastic Limit (%)	**18**	**20**	**15**
53.0	**100**	**100**	**100**	Plasticity Index (%)	**5**	**15**	**17**
37.5	**100**	**100**	**100**	Linear Shrinkage (%)	**2.7**	**6.9**	**7.3**
26.5	**100**	**100**	**100**	PI of whole sample	**4**	**12**	**16**
19.0	**100**	**100**	**100**				
13.2	**100**	**100**	**100**	% Gravel	**11**	**17**	**1**
9.5	**100**	**100**	**100**	% Sand	**58**	**34**	**62**
6.7	**96**	**97**	**100**	% Silt	**27**	**33**	**16**
4.75	**94**	**94**	**100**	% Clay	**4**	**16**	**21**
2.00	**89**	**83**	**99**	Activity	**1.3**	**0.9**	**0.8**
1.00	**88**	**79**	**98**				
0.425	**86**	**77**	**97**	% Soil Mortar	**89**	**83**	**99**
0.250	**84**	**75**	**81**				
0.150	**72**	**71**	**61**	Grading Modulus	**0.77**	**0.79**	**0.63**
0.075	**48**	**61**	**41**	Moisture Content (%)	**N / T**	**N / T**	**N / T**
0.050	**20**	**41**	**34**	Relative Density (SG)*	**2.65**	**2.65**	**2.65**
0.020	**13**	**31**	**30**				
0.006	**7**	**22**	**24**	Unified (ASTM D2487)	**SC-SM**	**CL**	**SC**
0.002	**4**	**16**	**21**	AASHTO (M145-91)	**A - 4**	**A - 6**	**A - 6**

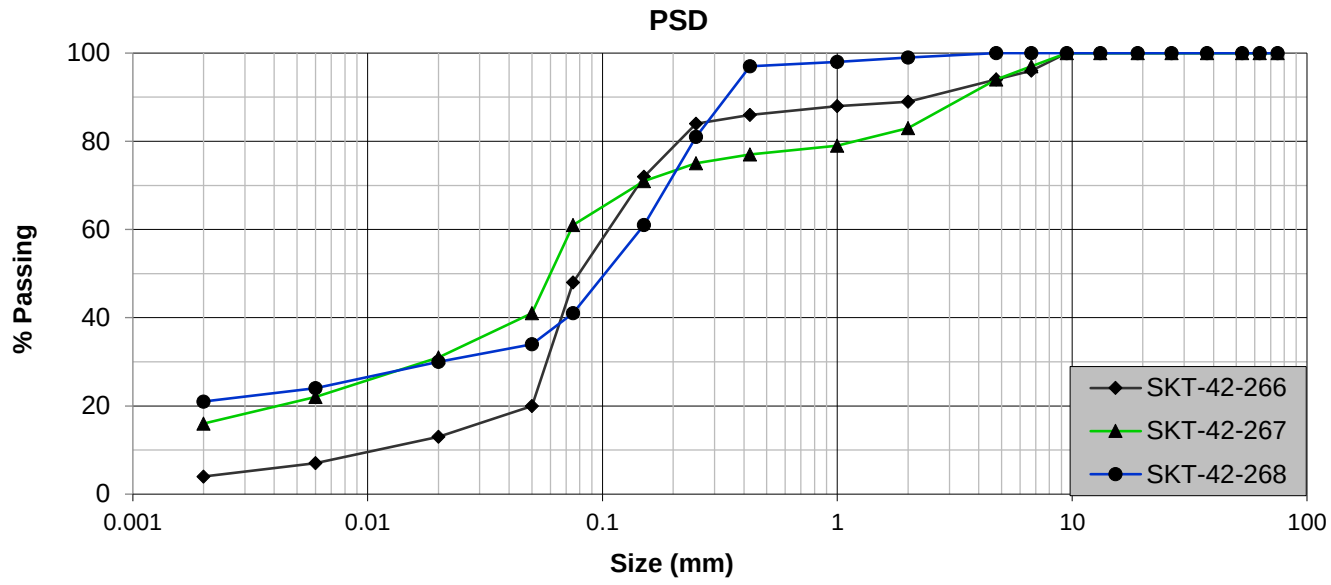
Remarks: *: Assumed
N / T: Not Tested

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

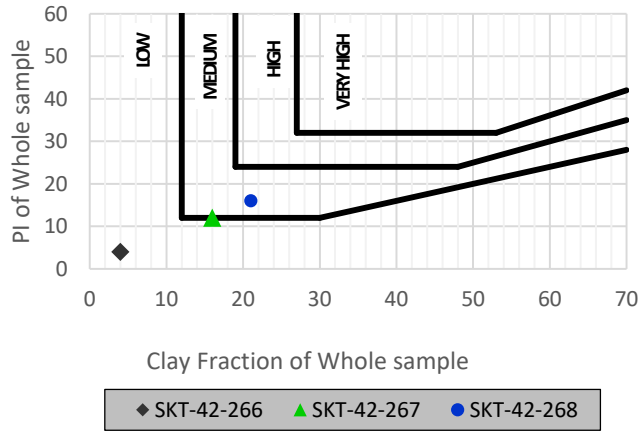
Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

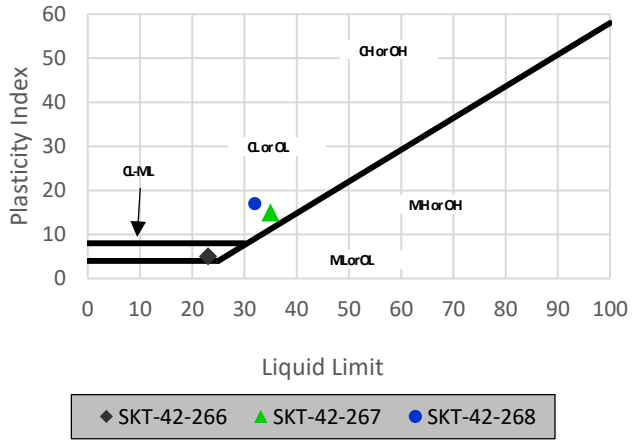
FOUNDATION INDICATOR



Potential Expansiveness



Casagrande Plasticity Chart



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

FOUNDATION INDICATOR

Grading & Hydrometer Analysis (Particle Size (mm) & % Passing)				Atterberg Limits & Classification			
Sample	TH 22	TH 25	TH 26	Sample	TH 22	TH 25	TH 26
Depth (mm)	1200 - 2300	600 - 1000	400 - 1500	Depth (mm)	1200 - 2300	600 - 1000	400 - 1500
Lab No	SKT-42-270	SKT-42-271	SKT-42-272	Lab No	SKT-42-270	SKT-42-271	SKT-42-272
75.0	**100**	**100**	**100**	Liquid Limit (%)	**30**	**50**	**31**
63.0	**100**	**100**	**100**	Plastic Limit (%)	**13**	**20**	**14**
53.0	**100**	**100**	**100**	Plasticity Index (%)	**17**	**30**	**17**
37.5	**100**	**100**	**100**	Linear Shrinkage (%)	**7.5**	**12.7**	**7.7**
26.5	**100**	**100**	**100**	PI of whole sample	**15**	**28**	**16**
19.0	**100**	**100**	**100**				
13.2	**100**	**100**	**100**	% Gravel	**2**	**1**	**1**
9.5	**100**	**100**	**100**	% Sand	**65**	**47**	**62**
6.7	**100**	**100**	**100**	% Silt	**15**	**16**	**19**
4.75	**99**	**100**	**100**	% Clay	**18**	**36**	**18**
2.00	**98**	**99**	**99**	Activity	**0.9**	**0.8**	**0.9**
1.00	**97**	**97**	**98**				
0.425	**88**	**92**	**94**	% Soil Mortar	**98**	**99**	**99**
0.250	**70**	**83**	**82**				
0.150	**56**	**74**	**63**	Grading Modulus	**0.74**	**0.5**	**0.61**
0.075	**40**	**59**	**46**	Moisture Content (%)	**N / T**	**N / T**	**N / T**
0.050	**28**	**48**	**31**	Relative Density (SG)*	**2.65**	**2.65**	**2.65**
0.020	**21**	**42**	**25**				
0.006	**19**	**39**	**20**	Unified (ASTM D2487)	**SC**	**CH**	**SC**
0.002	**18**	**36**	**18**	AASHTO (M145-91)	**A - 6**	**A - 7 - 6**	**A - 6**

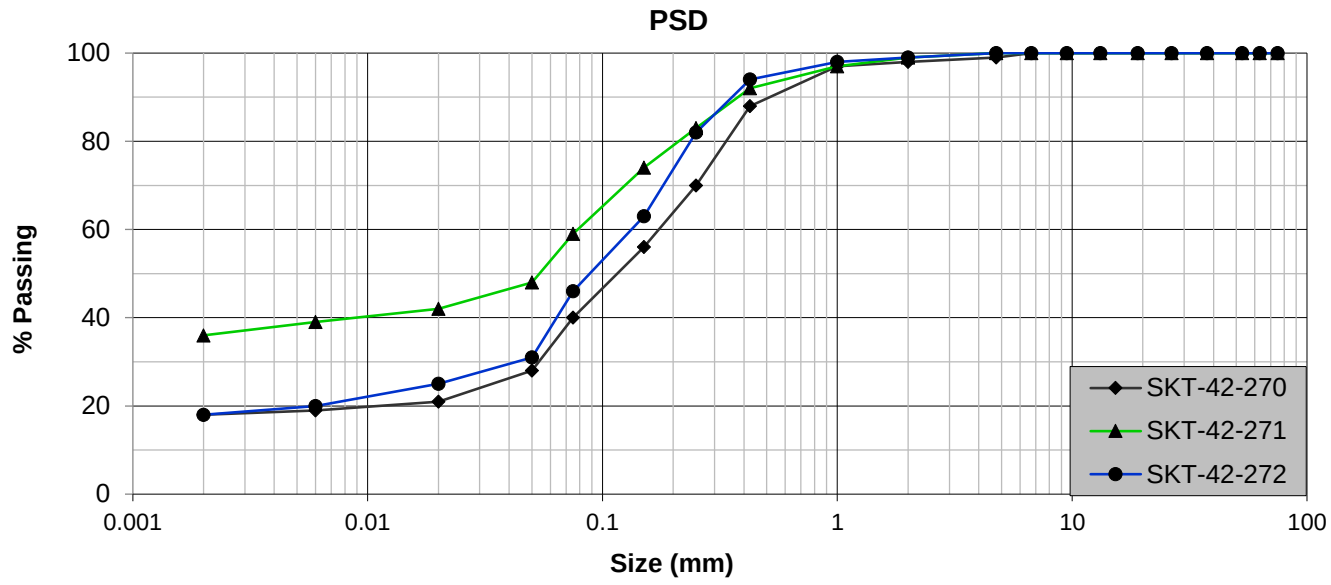
Remarks: *: Assumed
N / T: Not Tested

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

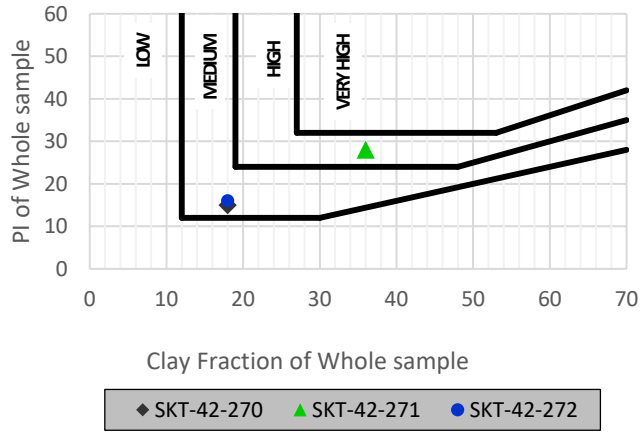
Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

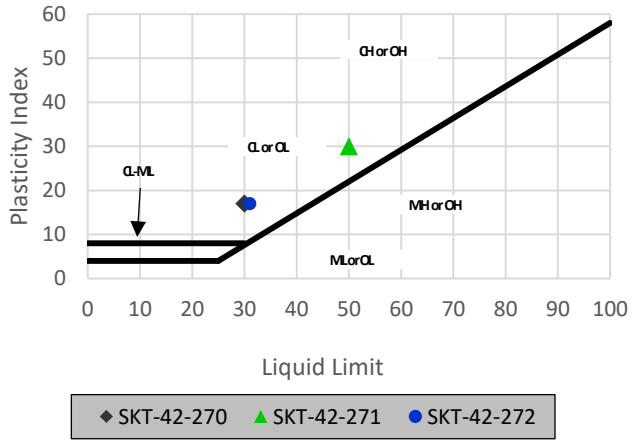
FOUNDATION INDICATOR



Potential Expansiveness



Casagrande Plasticity Chart



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

FOUNDATION INDICATOR

Grading & Hydrometer Analysis (Particle Size (mm) & % Passing)				Atterberg Limits & Classification			
Sample	TH 28	TH 30	TH 33	Sample	TH 28	TH 30	TH 33
Depth (mm)	700 - 2300	400 - 800	0 - 600	Depth (mm)	700 - 2300	400 - 800	0 - 600
Lab No	SKT-42-273	SKT-42-274	SKT-42-275	Lab No	SKT-42-273	SKT-42-274	SKT-42-275
75.0	**100**	**100**	**100**	Liquid Limit (%)	**46**	**32**	**20**
63.0	**100**	**100**	**100**	Plastic Limit (%)	**19**	**16**	**16**
53.0	**100**	**100**	**100**	Plasticity Index (%)	**27**	**16**	**4**
37.5	**100**	**100**	**100**	Linear Shrinkage (%)	**11.8**	**6.9**	**2.7**
26.5	**100**	**100**	**100**	PI of whole sample	**23**	**13**	**3**
19.0	**100**	**100**	**100**				
13.2	**100**	**100**	**100**	% Gravel	**6**	**5**	**12**
9.5	**100**	**100**	**100**	% Sand	**47**	**47**	**67**
6.7	**100**	**100**	**100**	% Silt	**19**	**21**	**11**
4.75	**98**	**99**	**98**	% Clay	**28**	**27**	**10**
2.00	**94**	**95**	**88**	Activity	**1.0**	**0.6**	**0.4**
1.00	**93**	**87**	**83**				
0.425	**87**	**80**	**77**	% Soil Mortar	**94**	**95**	**88**
0.250	**73**	**76**	**65**				
0.150	**63**	**70**	**42**	Grading Modulus	**0.64**	**0.67**	**1.08**
0.075	**55**	**58**	**27**	Moisture Content (%)	**N / T**	**N / T**	**N / T**
0.050	**42**	**42**	**17**	Relative Density (SG)*	**2.65**	**2.65**	**2.65**
0.020	**37**	**38**	**14**				
0.006	**31**	**31**	**11**	Unified (ASTM D2487)	**CL**	**CL**	**SM**
0.002	**28**	**27**	**10**	AASHTO (M145-91)	**A - 7 - 6**	**A - 6**	**A - 2 - 4**

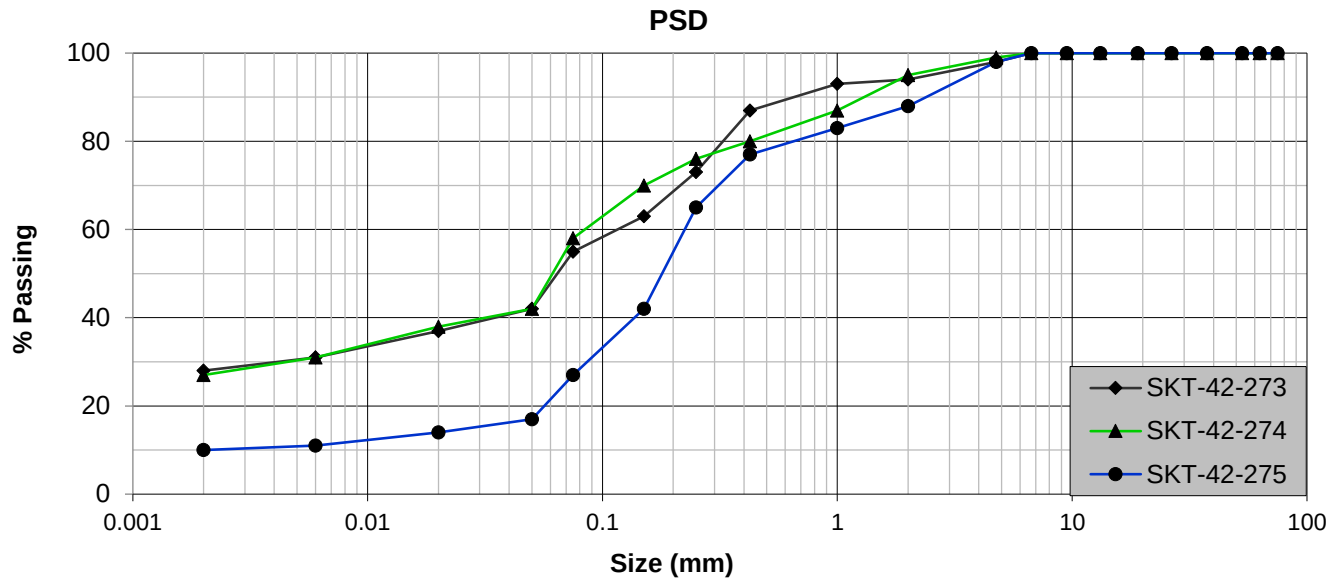
Remarks: *: Assumed
N / T: Not Tested

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

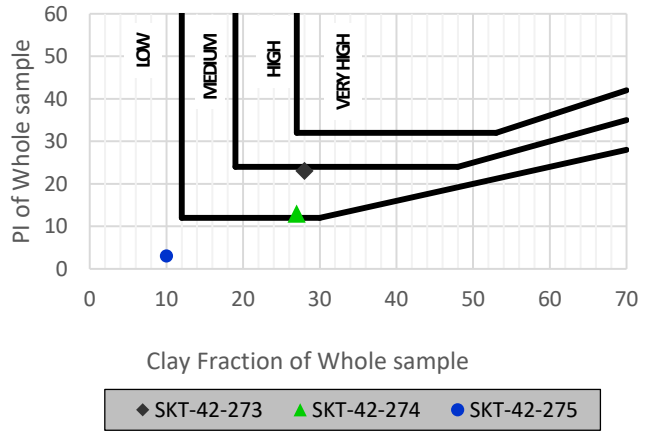
Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

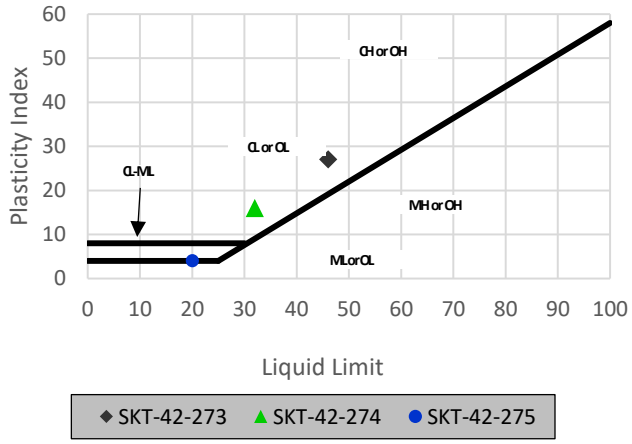
FOUNDATION INDICATOR



Potential Expansiveness



Casagrande Plasticity Chart



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

FOUNDATION INDICATOR

Grading & Hydrometer Analysis (Particle Size (mm) & % Passing)				Atterberg Limits & Classification			
Sample	TH 35	TH 39	TH 40	Sample	TH 35	TH 39	TH 40
Depth (mm)	0 - 700	400 - 900	1100 - 2400	Depth (mm)	0 - 700	400 - 900	1100 - 2400
Lab No	SKT-42-276	SKT-42-277	SKT-42-278	Lab No	SKT-42-276	SKT-42-277	SKT-42-278
75.0	**100**	**100**	**100**	Liquid Limit (%)	**17**	**24**	**50**
63.0	**100**	**100**	**100**	Plastic Limit (%)	**14**	**19**	**26**
53.0	**100**	**100**	**100**	Plasticity Index (%)	**3**	**5**	**24**
37.5	**100**	**100**	**100**	Linear Shrinkage (%)	**1.7**	**3.0**	**9.8**
26.5	**100**	**100**	**100**	PI of whole sample	**3**	**3**	**19**
19.0	**100**	**100**	**100**				
13.2	**100**	**100**	**99**	% Gravel	**0**	**8**	**7**
9.5	**100**	**99**	**98**	% Sand	**78**	**55**	**45**
6.7	**100**	**97**	**97**	% Silt	**17**	**13**	**25**
4.75	**100**	**95**	**96**	% Clay	**5**	**24**	**23**
2.00	**100**	**92**	**93**	Activity	**0.6**	**0.2**	**1.0**
1.00	**99**	**88**	**88**				
0.425	**90**	**63**	**80**	% Soil Mortar	**100**	**92**	**93**
0.250	**72**	**54**	**77**				
0.150	**56**	**47**	**70**	Grading Modulus	**0.75**	**1.04**	**0.66**
0.075	**35**	**41**	**61**	Moisture Content (%)	**N / T**	**N / T**	**N / T**
0.050	**14**	**35**	**39**	Relative Density (SG)*	**2.65**	**2.65**	**2.65**
0.020	**11**	**31**	**31**				
0.006	**7**	**26**	**26**	Unified (ASTM D2487)	**SM**	**SC-SM**	**CH**
0.002	**5**	**24**	**23**	AASHTO (M145-91)	**A - 2 - 4**	**A - 4**	**A - 7 - 6**

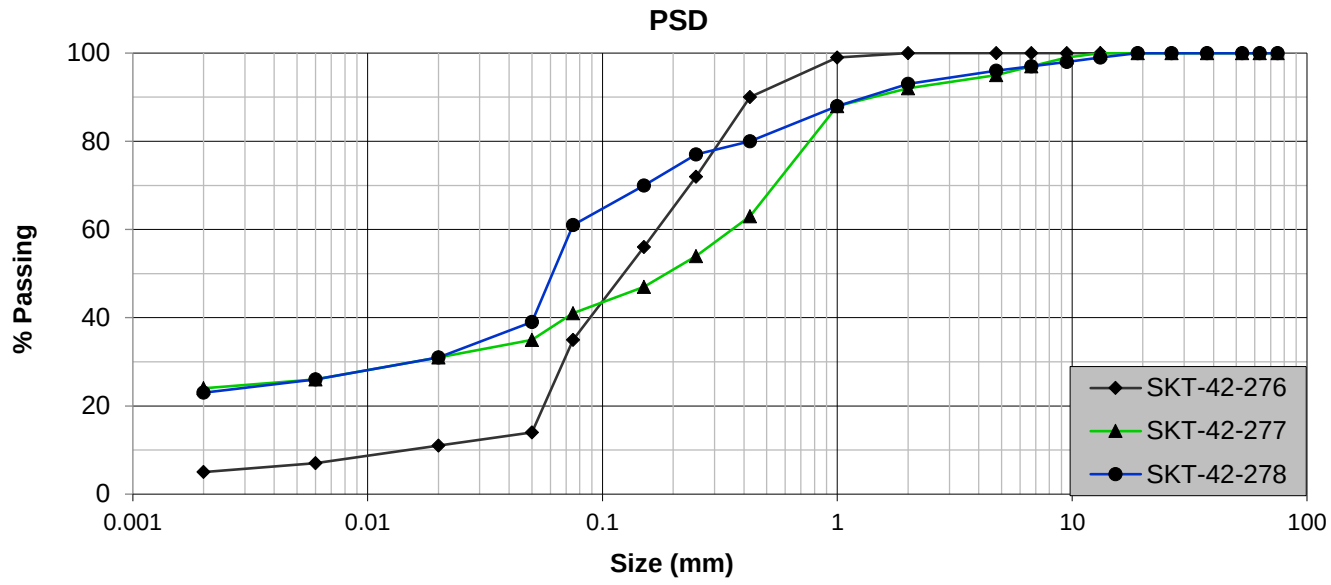
Remarks: *: Assumed
N / T: Not Tested

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

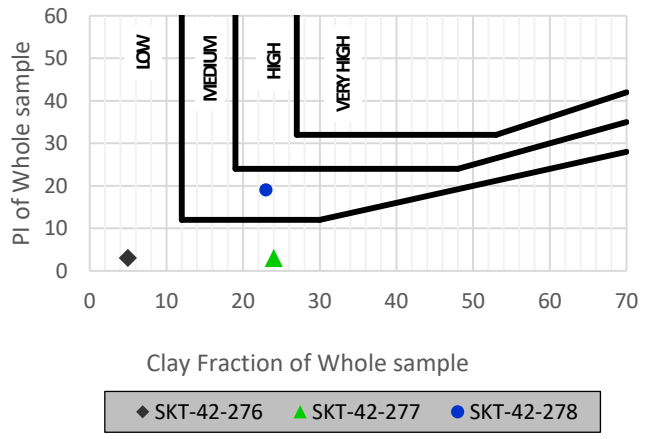
Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

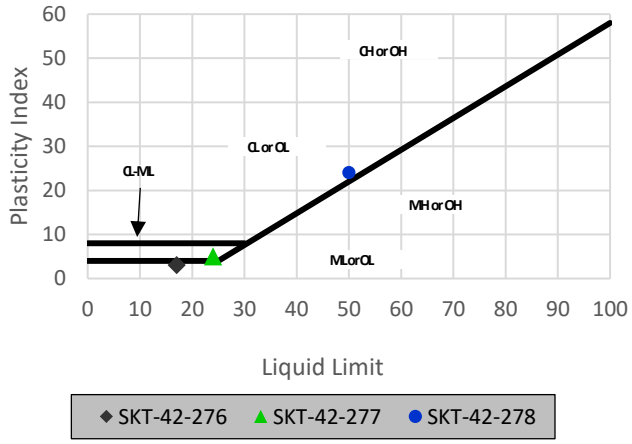
FOUNDATION INDICATOR



Potential Expansiveness



Casagrande Plasticity Chart



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

FOUNDATION INDICATOR

Grading & Hydrometer Analysis (Particle Size (mm) & % Passing)				Atterberg Limits & Classification			
Sample	TH 45			Sample	TH 45		
Depth (mm)	700 - 1500			Depth (mm)	700 - 1500		
Lab No	SKT-42-279			Lab No	SKT-42-279		
75.0	**100**			Liquid Limit (%)	**69**		
63.0	**100**			Plastic Limit (%)	**33**		
53.0	**100**			Plasticity Index (%)	**36**		
37.5	**100**			Linear Shrinkage (%)	**15.7**		
26.5	**100**			PI of whole sample	**36**		
19.0	**100**						
13.2	**100**			% Gravel	**1**		
9.5	**100**			% Sand	**33**		
6.7	**100**			% Silt	**29**		
4.75	**100**			% Clay	**37**		
2.00	**99**			Activity	**1.0**		
1.00	**99**						
0.425	**99**			% Soil Mortar	**99**		
0.250	**95**						
0.150	**90**			Grading Modulus	**0.21**		
0.075	**81**			Moisture Content (%)	**N / T**		
0.050	**56**			Relative Density (SG)*	**2.65**		
0.020	**47**						
0.006	**41**			Unified (ASTM D2487)	**CH**		
0.002	**37**			AASHTO (M145-91)	**A - 7 - 5**		

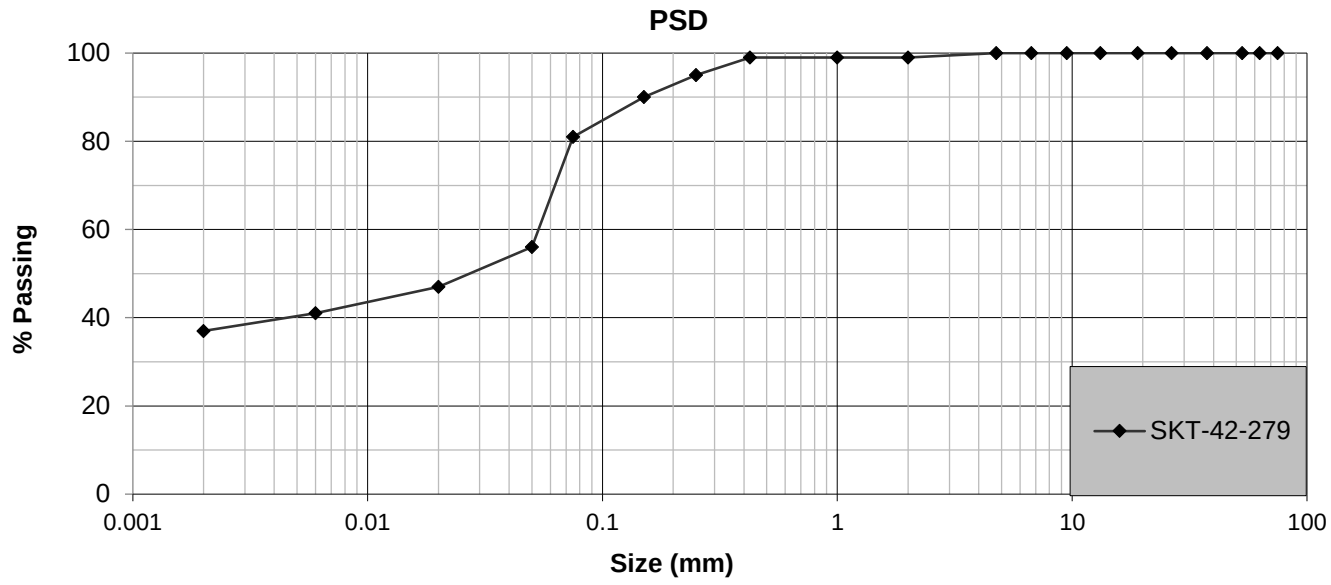
Remarks: *: Assumed
N / T: Not Tested

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

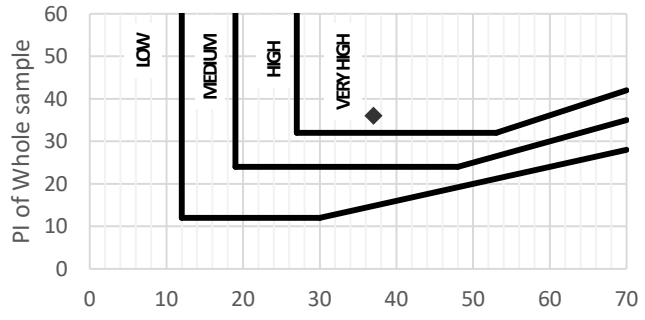
Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name: Soilkraft
Project Name: Roosboom
Job Number: SKT-42
Date: 2017-06-30
Method: SANS 3001 GR1, GR10 & ASTM D422

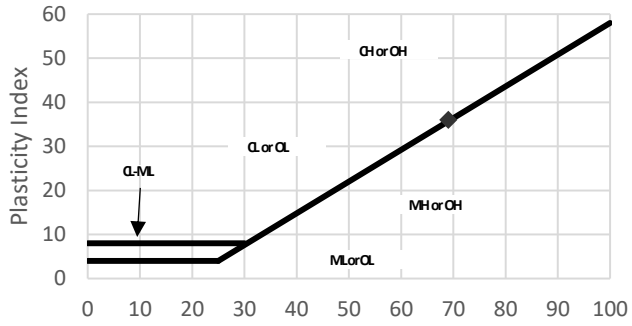
FOUNDATION INDICATOR



Potential Expansiveness



Casagrande Plasticity Chart



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

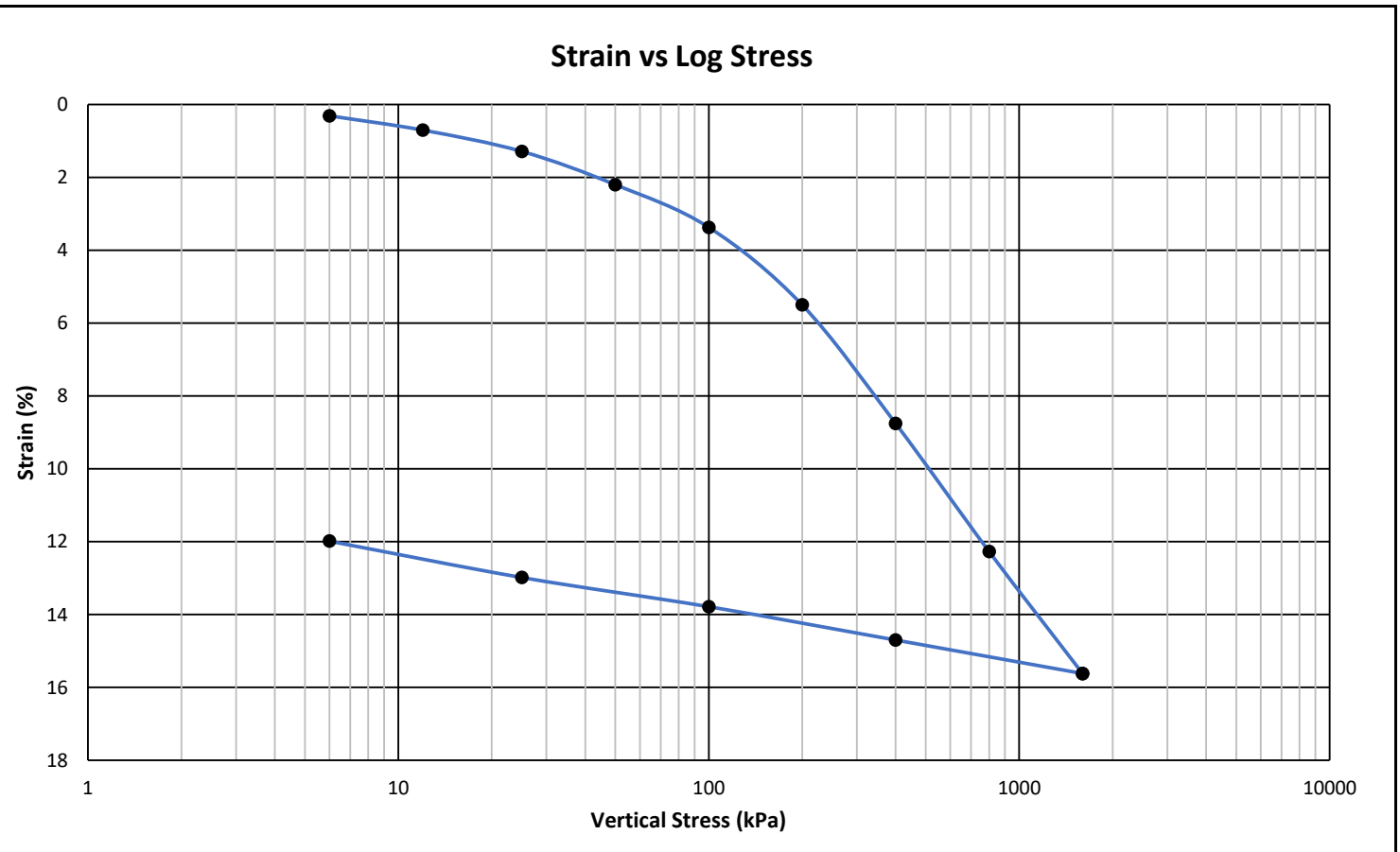
Client Name: Soilkraft
Project Name: Roosboom
Sample: TH 10
Depth: (mm) 0 - 400

Job Number: SKT-42
Lab Number: SKT-42-264
Method: BS 1377 Part 5
Date: 30/06/2017

ONE DIMENSIONAL CONSOLIDATION TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Undisturbed
Moisture Content	Initial	%	10.4	
	Final	%	16.5	
Dry Density		kg/m³	1579	
Void Ratio		-	0.666	
Degree of Saturation		%	41.1	
Relative Density (SG)		-	2.630	Determined

Vertical Stress Applied:	kPa	6	12	25	50	100	200	400	800	1600	400	100	25	6
Load applied for:	Hrs	12	12	12	12	12	12	12	12	12	3	3	3	3
Height after increment	mm	25.32	25.22	25.07	24.84	24.54	24.00	23.18	22.28	21.43	21.67	21.90	22.10	22.36
Total Strain	%	0.31	0.70	1.29	2.20	3.37	5.50	8.76	12.27	15.62	14.70	13.78	12.98	11.99
Void Ratio	-	0.661	0.654	0.644	0.629	0.610	0.574	0.520	0.461	0.406	0.421	0.436	0.450	0.466
Mv (1/Mpa)	-	-	0.658	0.452	0.370	0.240	0.221	0.172	0.096	0.048	0.009	0.036	0.124	0.603



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

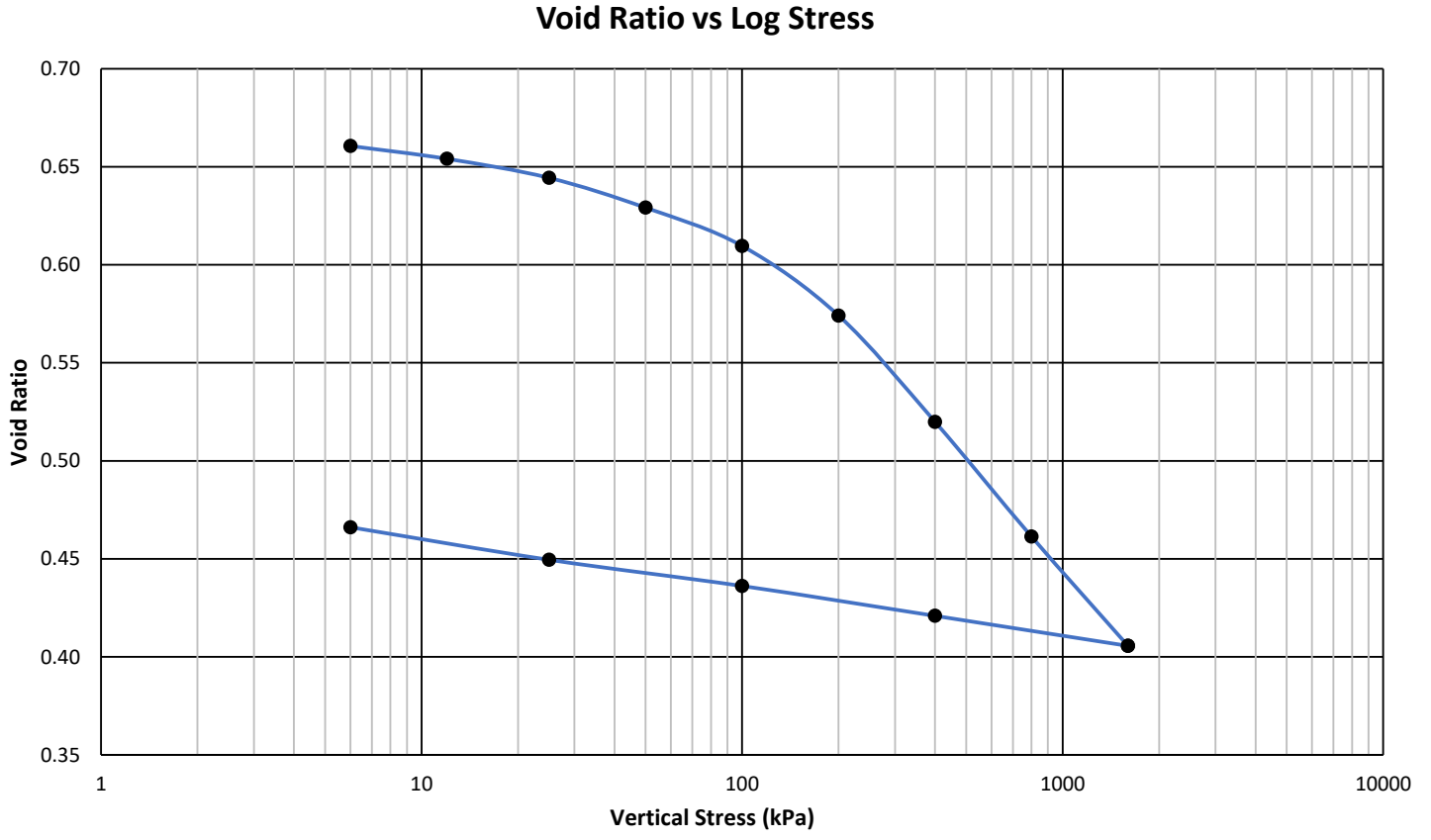
Client Name: Soilkraft
Project Name: Roosboom
Sample: TH 10
Depth: (m) 0 - 400

Job Number: SKT-42
Lab Number: SKT-42-264
Method: BS 1377 Part 5
Date: 30/06/2017

ONE DIMENSIONAL CONSOLIDATION TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Undisturbed
Moisture Content	Initial	%	10.4	
	Final	%	16.5	
Dry Density		kg/m³	1579	
Void Ratio		-	0.666	
Degree of Saturation		%	41.1	
Relative Density (SG)		-	2.630	Determined

Vertical Stress Applied:	kPa	6	12	25	50	100	200	400	800	1600	400	100	25	6
Load applied for:	Hrs	12	12	12	12	12	12	12	12	12	3	3	3	3
Height after increment	mm	25.32	25.22	25.07	24.84	24.54	24.00	23.18	22.28	21.43	21.67	21.90	22.10	22.36
Total Strain	%	0.31	0.70	1.29	2.20	3.37	5.50	8.76	12.27	15.62	14.70	13.78	12.98	11.99
Void Ratio	-	0.661	0.654	0.644	0.629	0.610	0.574	0.520	0.461	0.406	0.421	0.436	0.450	0.466
Mv (1/Mpa)	-	-	0.658	0.452	0.370	0.240	0.221	0.172	0.096	0.048	0.009	0.036	0.124	0.603



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

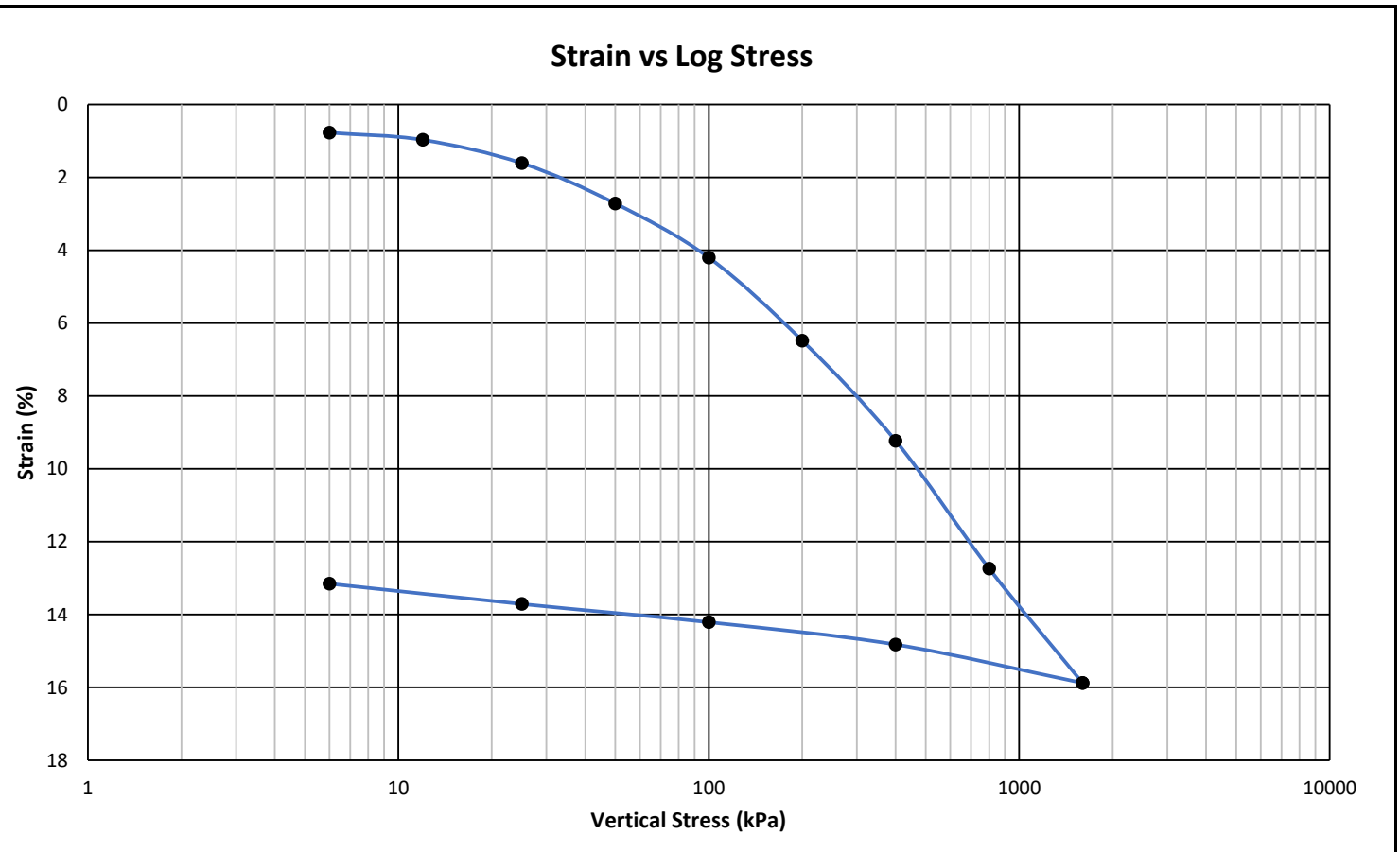
Client Name: Soilkraft
Project Name: Roosboom
Sample: TH 22
Depth: (mm) 0 - 800

Job Number: SKT-42
Lab Number: SKT-42-269
Method: BS 1377 Part 5
Date: 30/06/2017

ONE DIMENSIONAL CONSOLIDATION TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Undisturbed
Moisture Content	Initial	%	7.0	
	Final	%	13.4	
Dry Density		kg/m³	1647	
Void Ratio		-	0.600	
Degree of Saturation		%	30.8	
Relative Density (SG)		-	2.635	Determined

Vertical Stress Applied:	kPa	6	12	25	50	100	200	400	800	1600	400	100	25	6
Load applied for:	Hrs	12	12	12	12	12	12	12	12	12	3	3	3	3
Height after increment	mm	25.20	25.15	24.99	24.71	24.33	23.75	23.06	22.16	21.37	21.63	21.79	21.92	22.06
Total Strain	%	0.77	0.97	1.61	2.72	4.20	6.48	9.23	12.74	15.88	14.82	14.21	13.71	13.15
Void Ratio	-	0.587	0.584	0.574	0.556	0.532	0.496	0.452	0.396	0.346	0.363	0.372	0.380	0.389
Mv (1/Mpa)	-	-	0.331	0.497	0.449	0.305	0.238	0.147	0.097	0.045	0.010	0.024	0.078	0.340



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

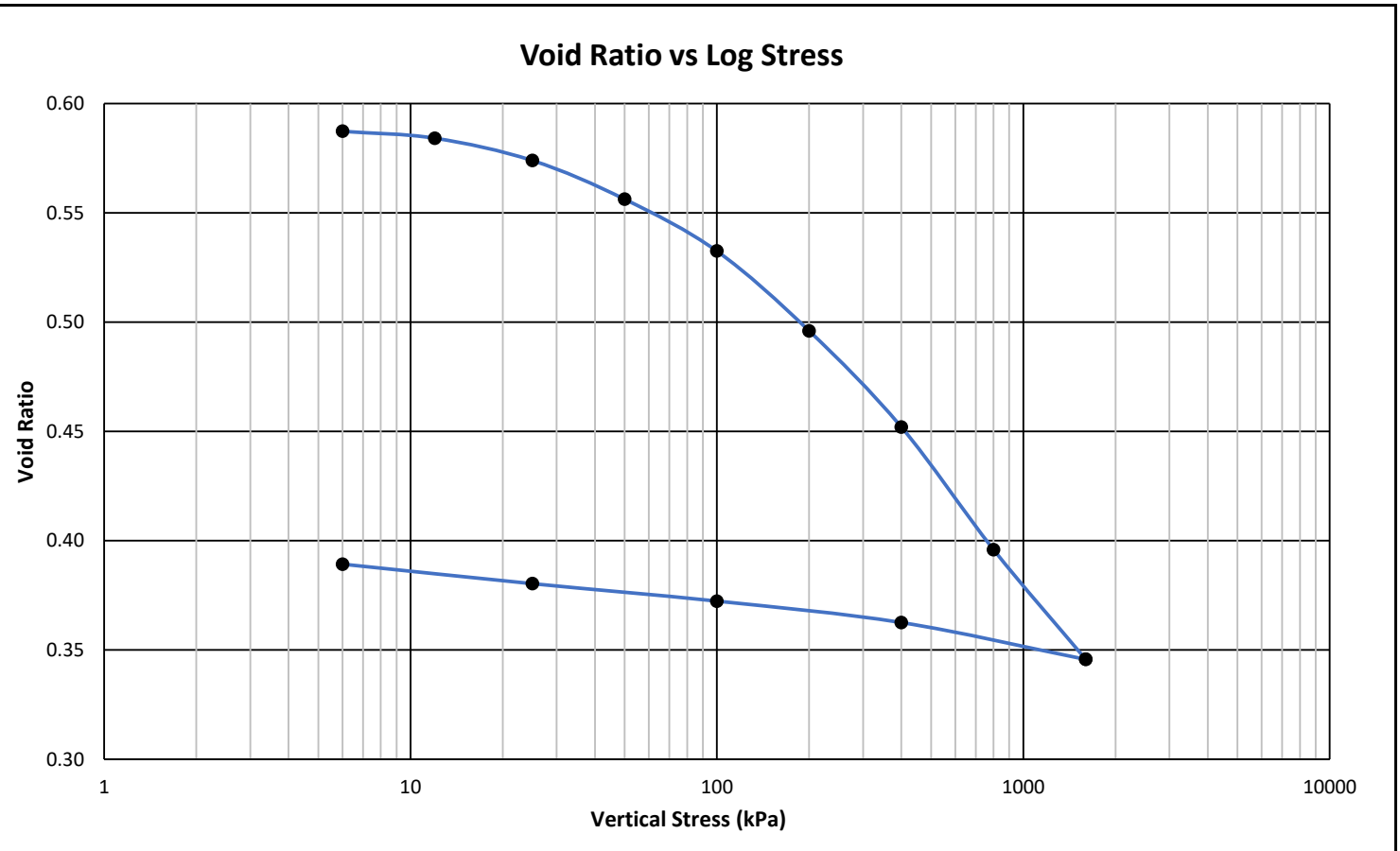
Client Name: Soilkraft
Project Name: Roosboom
Sample: TH 22
Depth: (m) 0 - 800

Job Number: SKT-42
Lab Number: SKT-42-269
Method: BS 1377 Part 5
Date: 30/06/2017

ONE DIMENSIONAL CONSOLIDATION TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Undisturbed
Moisture Content	Initial	%	7.0	
	Final	%	13.4	
Dry Density		kg/m³	1647	
Void Ratio		-	0.600	
Degree of Saturation		%	30.8	
Relative Density (SG)		-	2.635	Determined

Vertical Stress Applied:	kPa	6	12	25	50	100	200	400	800	1600	400	100	25	6
Load applied for:	Hrs	12	12	12	12	12	12	12	12	12	3	3	3	3
Height after increment	mm	25.20	25.15	24.99	24.71	24.33	23.75	23.06	22.16	21.37	21.63	21.79	21.92	22.06
Total Strain	%	0.77	0.97	1.61	2.72	4.20	6.48	9.23	12.74	15.88	14.82	14.21	13.71	13.15
Void Ratio	-	0.587	0.584	0.574	0.556	0.532	0.496	0.452	0.396	0.346	0.363	0.372	0.380	0.389
Mv (1/Mpa)	-	-	0.331	0.497	0.449	0.305	0.238	0.147	0.097	0.045	0.010	0.024	0.078	0.340



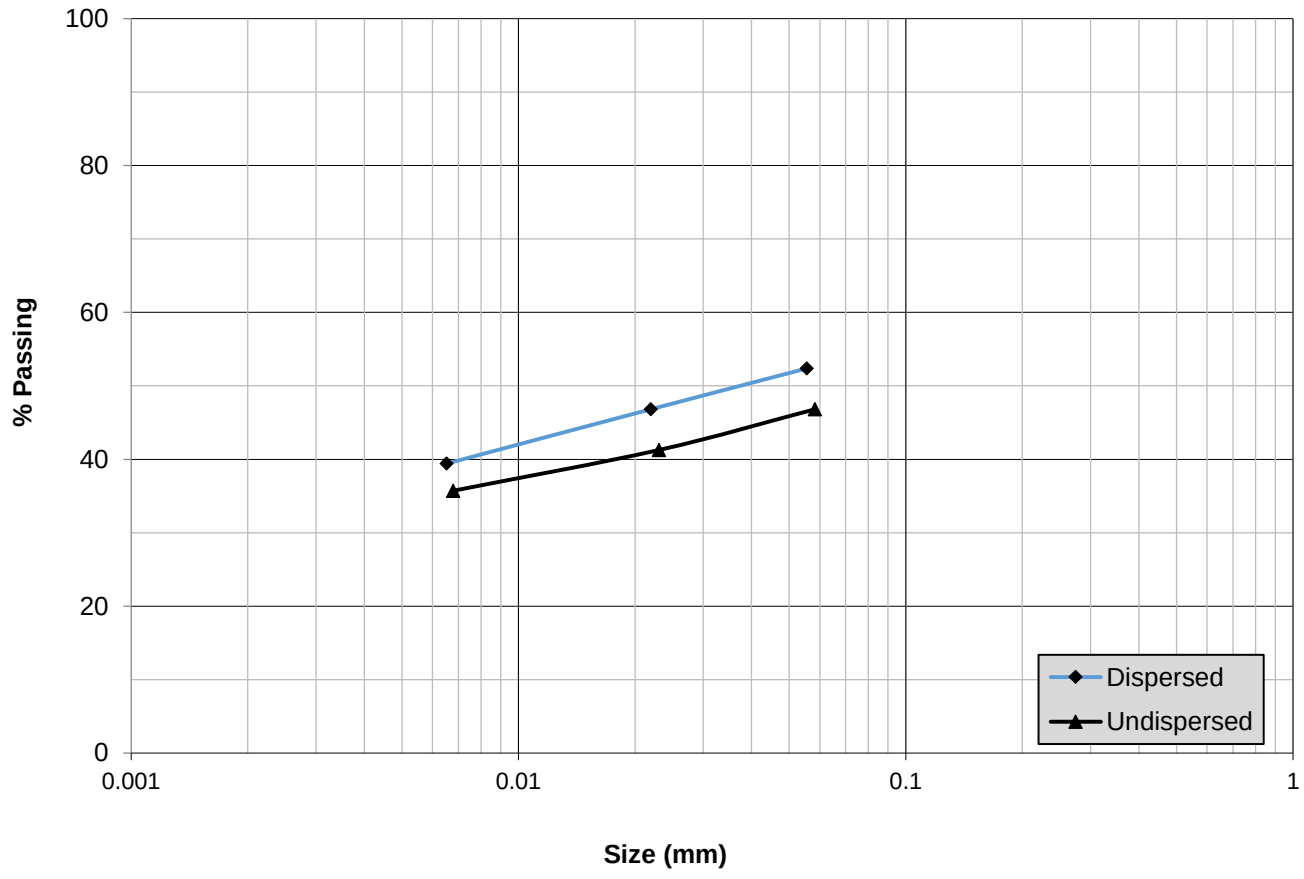
Specialised Testing Laboratory (Pty) Ltd
Asphalt | Aggregate | Bitumen | Geotechnical
Quality | Excellence | On Time

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name:	Soilkraft
Project Name:	Roosboom
Sample Number:	TH 30 / 400 - 800mm
Lab Number:	SKT-42-274
Job Number:	SKT-42
Date:	30/06/2017
Method:	ASTM D4221

DOUBLE HYDROMETER

Dispersion: **91%**



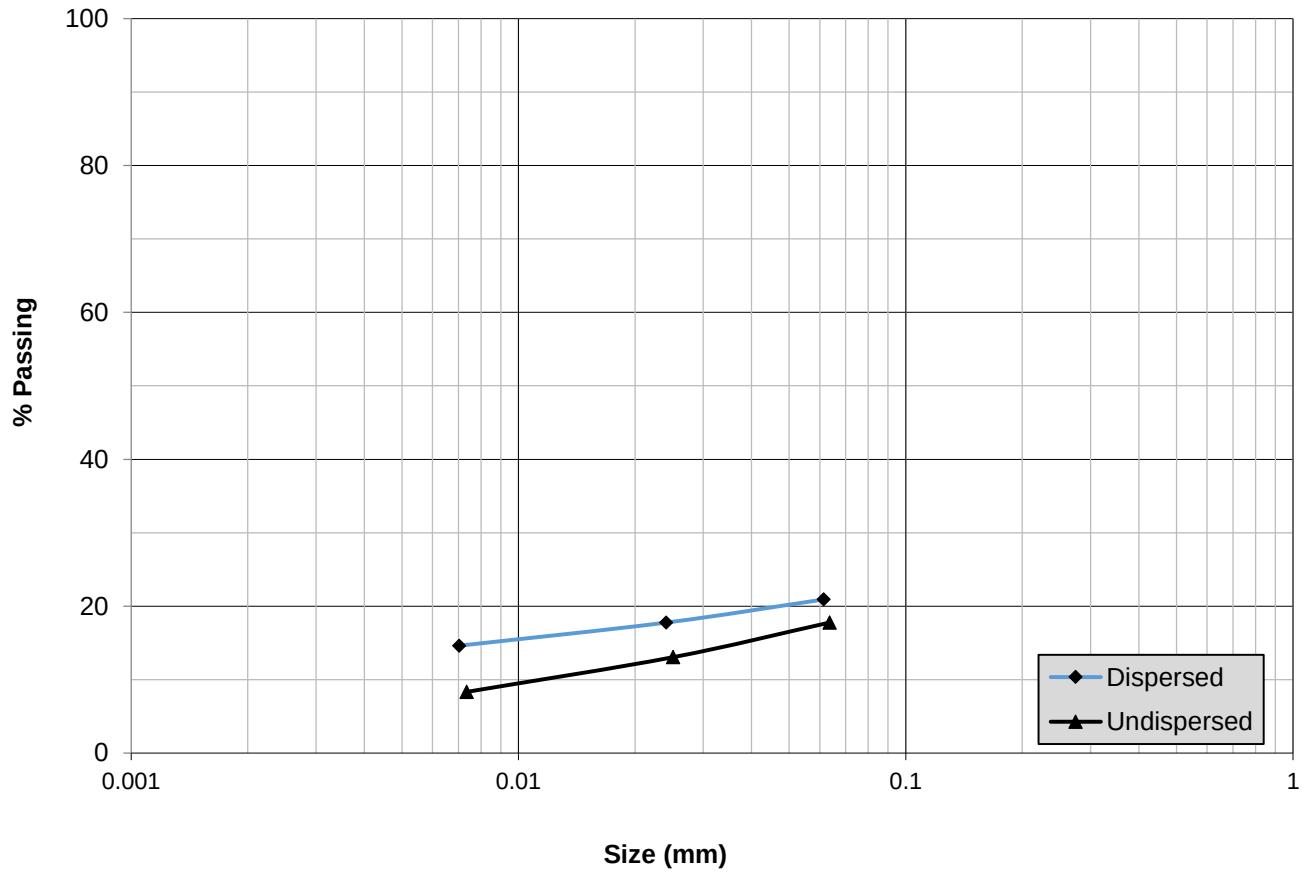
Specialised Testing Laboratory (Pty) Ltd
Asphalt | Aggregate | Bitumen | Geotechnical
Quality | Excellence | On Time

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name:	Soilkraft
Project Name:	Roosboom
Sample Number:	TH 33 / 0 - 600mm
Lab Number:	SKT-42-275
Job Number:	SKT-42
Date:	30/06/2017
Method:	ASTM D4221

DOUBLE HYDROMETER

Dispersion: **57%**



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

Unit 1, 13 Bloubokkie Street, Koedoespoort 0186
Roelof | 072 674 6343 | roelof@stlab.co.za
Gerrie | 082 309 4448 | gerrie@stlab.co.za
www.stlab.co.za

Client Name:	Soilkraft
Project Name:	Roosboom
Sample Number:	TH 35 / 0 - 700mm
Lab Number:	SKT-42-276
Job Number:	SKT-42
Date:	30/06/2017
Method:	ASTM D4221

DOUBLE HYDROMETER

Dispersion: **84%**