

**GEOTECHNICAL INVESTIGATION FOR
TOWN ESTABLISHMENT AT KAMEELDRIFT 298JR
PORTIONS R/9, 154, 454, 455 & 456**

REPORT

TO

**LEBRA DEVELOPMENTS (PTY) LTD
(AND CITYSCOPE TOWN PLANNERS)**

BY

**VELA VKE
CONSULTING ENGINEERS**

REPORT NO.: PJ091/KJ/2005/11/2057

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Version	Date	Details of Revision	Prepared	Reviewed	Approved
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CONTENTS

1. INTRODUCTION AND TERMS OF REFERENCE	3
1.1 Scope	3
1.2 Terms of Appointment	3
1.3 Aims and Methodology	3
1.4 Limitations of Assessment	3
2. DESCRIPTION OF SITE AND SURROUNDING AREA	4
2.1 Location and Site description	4
2.2 Drainage and Topography	4
3. GEOTECHNICAL INVESTIGATION AND GROUND CONDITIONS	4
3.1 Overview	4
3.2 Geology	4
3.3 Ground Conditions	4
3.4 Excavatability	5
3.5 Stability of Trenches	5
3.6 Groundwater	5
3.7 Made Ground /Fill	5
3.8 Laboratory testing	5
4. GEOTECHNICAL CONCLUSIONS	6
5. RECOMMENDATIONS	8
5.1 ZONE R;	8
5.2 ZONE H/R:	8
5.3 ZONE C1:	8
5.4 ZONE C2:	8
6. REFERENCES	9

APPENDICES

- Appendix A; Trial Pit Profiles
- Appendix B; Profiling and Logging Parameters
- Appendix C; Laboratory Test Results
- Appendix D; Photographs

FIGURES

- Figure 1; Trial Pit and Borehole Locations.



1. INTRODUCTION AND TERMS OF REFERENCE

1.1 Scope

This report presents the findings of a geotechnical investigation for a proposed new housing development on Kameeldrift 298JR, in the Nokeng Tsa Taemane Local Municipality, Gauteng. The investigation was aimed at providing general geotechnical information for the purposes of town establishment on the site. The development on the site will comprise the construction of single and double storey houses on an approximately 40ha site.

1.2 Terms of Appointment

The work was carried out in accordance with our quote No 845 and the verbal instruction to proceed given by Mr D Saayman received on 12 September 2005 on behalf of Lebra Developments.

1.3 Aims and Methodology

The objectives of the study are:

- To provide foundation recommendations for the proposed housing development and classify the site according to the National Home Builders Registration Council (NHBRC) guidelines.
- Analysis of the geotechnical conditions present and recommendations for site works.
- To comment on geotechnical factors that would have an impact on the development of the site.

The following methodology was adopted to realise the aims of the study:

- Review of available geological records and site plans.
- Undertaking of a geotechnical site investigation to profile soils, investigate soil strengths/capacities and the identification of potential problem soils on site.
- Undertaking of laboratory tests and DPLs to establish geotechnical and design parameters of the soils.
- Identification of relevant ground-related features and their influence on the proposed development.

1.4 Limitations of Assessment

The investigation comprised a limited number of trial pits and is not likely to reveal the detail of the conditions that will become evident during construction. It is thus imperative that a Competent Person inspects all excavations to ensure that conditions at variance with those predicted do not occur and to undertake an interpretation of the facts supplied in this report to apply to on-site conditions as exposed during development of the site.

It is possible that certain indications of ground contamination or ground water levels were latent or otherwise not visible. Our opinions can only be based on what was visible at the time the visit was conducted.

This report was prepared solely for the use by Lebra Developments (Pty) Ltd. for the purpose stated and should not be relied upon by, or transferred to, any other party.



2. DESCRIPTION OF SITE AND SURROUNDING AREA

2.1 Location and Site description

The site, Portions R/9, 154, 454, 455 and 456 of the farm Kameeldrift 298JR, is located approximately 17km north east of Pretoria city centre in the in the Nokeng Tsa Taemane Local Municipality, Gauteng. Access to the site is along of the R513 (P2-5) Zambezi Road. The site has approximate WGS84 co-ordinates of Lo29 66,500mY and 2,841,250mX; and is approximately 40ha in size; a site location plan is given on Figure 1.

An aerial photograph of the site is also given as Figure 1. The site is currently mostly undeveloped and vegetation comprises grassland with some bushes and occasional large trees. Several existing single storey houses and outbuilding are located on the property.

2.2 Drainage and Topography

The site is characterised by two quartzite hills in the central, eastern and western portions of the site. The northern part of the site slopes to the northeast at an average slope of 8%, gradients on the remainder of the site steepen towards the hills.

Drainage is in the form of sheet wash and no watercourses are present.

3. GEOTECHNICAL INVESTIGATION AND GROUND CONDITIONS

3.1 Overview

The geotechnical investigation, which included 26 trial pits, was carried out on Monday 19th and Tuesday 20th September 2005. The trial pits were excavated using a JCB 3CX excavator (TLB). Soil samples were recovered from representative materials on site and submitted for laboratory testing (particle size analysis and indicator tests on disturbed samples and double oedometer tests on an undisturbed sample).

3.2 Geology

The geological map of Silverton (sheet no. 2528CB, scale 1:50 000, published 1969) shows the two quartzite hills of the Magaliesberg Quartzite Formation towards the southern and central portions of the site with a diabase intruded in the form of an extensive sill surrounding the quartzite.

3.3 Ground Conditions

The 26 trial pits excavated, were distributed across the whole site to provide an overall assessment of the geotechnical conditions for the purposes of providing foundation recommendations for the proposed housing development and to classify the site according to the NHBRC guidelines. Where rock was observed to occur on surface (i.e the quartzite hills) no trial pits were undertaken. The trial pits were logged by a geospecialist and the locations of these are shown on Figure 1. Trial pit profiles are included in Appendix A.

The trial pits revealed conditions to be fairly variable across the site. Two general soil profiles were encountered:

1. The central portions of the site were characterised by the presence of quartzite at surface or at shallow depth in the vicinity of the quartzite hills. Quartzite was observed on surface on the hills themselves, while down slope of these hills trial pits showed thin surface strata of talus and hillwash overlying quartzite. The thickness of the talus and hillwash increases away from the hills, but its occurrence was limited to within the immediate vicinity of the hills.



2. Transported silty sands overlying diabase occur on the remainder of the site. The thickness of the transported materials varies over the site. Close to the quartzite hills, thin surface veneers of transported materials overlying completely weathered, friable, diabase occur. Elsewhere, and particularly in the northern portions of the site, thick layers of transported silty sands (up to 1.9m thick) occur and these overlie residual (completely weathered, resembling a soil) diabase.

3.4 Excavatability

No trial pits were excavated where quartzite outcrops were observed. The quartzite is expected to be highly fractured and in places overlain by a thin surface veneer of talus. The quartzite is widely bedded and will usually excavate in large blocks and will present excavation problems. Excavations will classify as intermediate¹ to hard and may require blasting, particularly where excavations deeper than 0.5m deep are required.

Refusal of the TLB occurred on quartzite or on diabase at between 0.4 and 0.6m where trial pits were excavated down slope, near the two hills. Excavations will classify as soft to 0.5m depth but below this intermediate to hard excavation can be expected and some blasting can be expected, particularly below 1.0m depth.

On the remainder of the site, refusal occurred at depths greater than 1.5m. Here the materials encountered would classify as "soft" according to the SABS 1200 D Earthworks classification, or as "Soft class 2" (materials which can be readily excavated with the aid of a pick) up to "Soft class 3" (materials which can be excavated with difficulty with the aid of a pick) according to the Department of Works, (Watermeyer 1997).

3.5 Stability of Trenches

No collapse of trial pits walls occurred and excavations were assessed as being stable. In the northern portions of the site, the transported silty sands encountered were occasionally loose and particular care, with appropriate protection of workers, should be exercised with deep excavations (i.e. greater than 1.5m) particularly after rainy periods.

Trial pits excavated during the geotechnical investigation are narrow and much smaller than the excavations required for services and foundations and will give an optimistic indication of the stability of long trench excavations. It remains the responsibility of the contractor and engineer on site to ensure that excavations are safe.

3.6 Groundwater

No groundwater seepage was encountered on the site during the investigation; the site was however visited at the end of the summer rainfall season. Seepage can be expected to occur along the foot of the quartzite hills.

3.7 Made Ground /Fill

No made ground/fill was encountered in any of the trial pits. Foundations should not be placed on any made ground on the site, if encountered, due to its variability in nature and potential for settlement.

3.8 Laboratory testing

Laboratory tests were scheduled to confirm the on site investigation and establish engineering parameters for the soils. The various tests and pertinent information from these tests are highlighted below; test results are included as Appendix C.

¹ According to SABS 1200 D Earthworks classification



Indicator Tests; The tests showed very consistent results for the transported silty sands tested on the site. The grading analysis showed them to be single sized silty fine sands with over 90% of the particles between 0.075mm and 0.425mm and with a very low/no clay content. This is typical of the aeolian (wind transported) sands and is also an indication of the potential collapse of the grain structure. In places higher clay contents were noted and here the soils classify on the boundary of "low" and "medium" potential expansiveness². The test results are summarised in the table below:

Trial pit No.	Depth of sample	% Clay	% Silt	% Sand	PI	Description of soil (from soil profile)	Potential expansiveness classification
KM04	700– 900	13	16	71	5	Silty sand, orange, transported.	Low
KM07	700– 900	25	17	58	15	Silty sand, red, residual diabase.	Low to medium
KM14	500– 700	27	14	58	14	Silty sand, orangey red, transported.	Low to medium
KM18	500– 700	17	13	69	7	Silty sand, red, transported.	Low
KM22	500– 700	11	12	76	8	Silty sand, red, transported.	Low

Collapse Potential; A double oedometer test was carried out on an undisturbed soil sample taken from KM22 in the northern part of the site. The test showed a collapse potential of 13% in the medium dense silty sand, which classifies as "severe trouble" in terms of Jennings and Knight. Normal and collapse settlement were calculated for the site, assuming 2.0m of transported materials occurring from surface, and are given in the table below.

	Settlement at 25kPa	Settlement at 50kPa	Settlement at 100kPa
Normal Settlement	<5mm	<10mm	10mm
Collapse Settlement	10mm	30mm	70mm

As may be seen from the table, at 50kPa (i.e. the approximate loading of a single storey building) the normal settlements are fairly low (less than 10mm) but the collapse settlement is excessive with 30mm of collapse settlement predicted. In all cases the total settlement (i.e. normal plus collapse settlement) is greater than 40mm and this classifies this portion of the site as a NHBRC soil class C2 site.

4. GEOTECHNICAL CONCLUSIONS

A Phase 2 NHBRC geotechnical investigation which included 26 trial pits was carried out to investigate the founding conditions on Portions R/9, 154, 454, 455 and 456 of the farm Kameeldrift 298JR, for the development of housing (single and two storey housing). The investigation was aimed at classifying the site according to the NHBRC guidelines.

The trial pits revealed conditions to be fairly variable across the site. The central portions of the site were characterised by a shallow rock profile associated with two quartzite hills which occur on the site. Quartzite was observed on surface on the hills themselves, while down slope of these hills trial pits showed thin surface strata of talus and hillwash overlying quartzite. The thickness of the talus and hillwash increases away from the hills but its occurrence was limited to within the

² Based on Van Der Merwe D.H, 1964.



immediate vicinity of the hills. Based on this soil profile this portion of the site was classified (based on the NHBRC guideline manual) into two zones; Zone R (where rock was observed on surface or up to 0.3m depth) and Zone R/S (where rock was found to be overlain by up to 0.8m of talus and hillwash).

Transported silty sands overlying diabase occur on the remainder of the site. The thickness of the transported materials varies on the site. Close to the quartzite hills, thin surface veneers of transported materials overlying completely weathered, friable, diabase occur. Elsewhere, and particularly in the northern portions of the site, thick layers of transported silty sands (up to 1.9m thick) occur and these overlie residual (completely weathered, resembling a soil) diabase. Based on these soil profiles these part has been divided into zones as follows:

- where weathered diabase rock occurs near surface these portions of the site are incorporated in Zone R/S (discussed above),
- Zone C1; where the transported silty sands are less than 1.0m thick (i.e. 0.5m thick below foundations) and underlain by residual gravelly sands and gravels or completely weathered diabase.
- Zone C2; where transported silty sands occur to depths greater than 1.0m thick.

The zones are indicated on Figure 1, while the characteristics of these zones are tabulated below. High costs for development are expected for Zone C2 and moderate costs for Zone R and Zone C1.

Zone	Zone R	Zone R/S	Zone C1	Zone C2
Geology/ ground conditions	Rock (quartzite)	Rock (quartzite/ diabase at shallow depths)	Transported silty sands less than 1.0m thick	Transported silty sands deeper 1.0m.
Location	Quartzite Hills in centre of site	Around hills in centre and southern portions	Small occurrences on edges of site	Northern portion of site
NHBRC site class designation	R	R/S	C1	C2
Active soil	No soil heave potential	No soil heave potential	Low soil heave potential	Low soil heave potential
Settlement from collapse.	No soil collapse potential	No soil collapse potential	Moderate soil settlements from collapse	High soil settlements from collapse
Excavatability	Blasting required; hard rock	Soft to 0.5m, below this blasting may be required	Soft to 1.5m	Soft to 1.5m
Slopes	Steep (>10%)	Intermediate (10%)	Intermediate (ave 8%)	Intermediate to flat (ave 8%)
Flooding	Low	Low	Low	Low
Seepage	Favourable	Favourable	Favourable	Favourable
Stability (Dolomite and undermining)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Relative cost of development.	moderate	normal	moderate	high cost
Approximate area distribution (%)	25%	25%	10%	40%



5. RECOMMENDATIONS

Ground conditions on the site are generally favourable and recommendations for foundations are based on the NHBRC manual for the zones identified above.

5.1 ZONE R;

Conditions for development are favourable for Zone R (shallow rock); although shallow rock is expected, it is highly weathered and fractured and should break out easily. However, some blasting can be expected. Excavations for foundations and for services should be kept as shallow as practicably possible to reduce the amount of blasting.

5.2 ZONE H/R:

Foundation conditions are very favourable on this portion of the site with weathered quartzite and diabase occurring at shallow depth. Normal construction with conventional strip foundations can be used. Foundations can be excavated by hand (although with difficulty) up to 500mm depth, although rock levels are likely to vary. Services should be placed as shallow as practically possible and allowance for blasting of excavations deeper than 500mm should be made.

5.3 ZONE C1:

Foundation conditions are generally favourable although some treatment of foundations is required to protect against the predicted settlements. Modified normal foundations as set out in the NHBRC guideline document are recommended. This must include the following treatment; excavate foundations to 0.5m depth, saturate the base of trenches and compact with 4 passes of a vibratory compactor, reinforce strip foundations, include light reinforcement in masonry and limit bearing pressures to 50kPa. Site drainage and plumbing precautions should also be undertaken.

5.4 ZONE C2:

Foundation conditions are unfavourable with treatment of foundations required to protect against the predicted collapse settlements. Feasible foundation options for this portion of the site include:

1. *Soil raft*; This includes excavation of the in-situ material to 1.0m beyond perimeter of the building to a depth of 2.0m and its replacement compacted to 93% MOD AASHTO density at -1% to +2% of optimum moisture content. Foundation pressures should not exceed 50kPa. Normal construction with lightly reinforced strip footings and light reinforcement in the masonry is recommended.
2. *Stiffened Raft*; This entails a concrete raft foundation purpose designed to accommodate a maximum of 30mm collapse settlement. A proprietary raft such as a Waffle Raft would be suitable. The superstructure of the buildings will have to be articulated to avoid cracking.

Piled foundations or deep strip foundations to the depth of the residual diabase, at up to 2m depth could also be implemented. However neither of these has been considered as feasible for a development comprising single storey buildings and the associated light loads.



FP Pequenino
Engineer



Ad Stuart Pr Sci Nat
Vela VKE



6. REFERENCES

1. 1:50 000 Geological Sheet 2528CB Silverton. Council for Geoscience. 1976.
2. SABS 1200; "Code of practice for use with standardised specifications for civil engineering construction and contract documents". Second revision, SABS Pretoria, 1986.
3. VAN DER MERWE D.H. The prediction of heave from the plasticity index and percentage clay fraction of soils. SAICE 1964
4. NHBRC, National Home Builders Registration Council. Home Building Manual Revision no.1. February 1999.
5. JENNINGS J.E. and KNIGHT K. A guide to construction on or with materials exhibiting additional settlement due to "collapse" of grain structure.
6. NATIONAL DEPARTMENT OF HOUSING. "Geotechnical site investigations for housing developments. Generic specification GFSH-2". Pretoria 2002.



Appendix

A

Trial Pit Profiles

TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM01
X COORD: 2841062
Y COORD: 66886
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
		Medium dense, silty SAND. Dry, becoming slightly moist from 600mm, red, transported, occasionally with ferruginised gravel.				
	1.6	Refusal on very soft rock quartzitic sandstone.				

NOTES

- 1: No DPL
- 2: No samples
- 3: No seepage
- 4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM02
X COORD: 2841065
Y COORD: 66770
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.3	Medium dense, silty SAND. Dry, becoming slightly moist from 600mm, red, transported, occasionally with ferruginised gravel.				
	1.4	Medium dense, silty SAND. Dry to slightly moist, light orange, transported. Pebble marker at 1400mm				
	1.8	Medium dense, slightly gravelly, silty SAND. Slightly moist, yellow speckled black, residual diabase structures discernible.				
		No refusal, hole stopped.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM03

X COORD: 2841161

Y COORD: 66721

ELEVATION:

PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
		Loose, silty SAND. Dry, light pinkish grey to white, transported.				
	1.0					
		Medium dense, silty SAND and occasional gravel. Slightly moist, dark orange speckled black, with white sand from above in narrow vertical bands. Gravel up to 12mm, ferruginised.				
	2.0					
		No refusal but dense.				

NOTES 1: No DPL

2: No samples

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM04
X COORD: 2841191
Y COORD: 66604
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.6	Loose to medium dense, silty SAND. Dry, light pinkish grey to white, transported.				
	1.5	Medium dense, silty SAND. Dry, orange mottled white and red, transported. Pebble marker at 1500mm.				
	2.0	Medium dense to dense, silty SAND. Slightly moist, red mottled orange and speckled black, ferruginised, residual diabase.				
		No refusal but dense.				

NOTES 1: No DPL

2: Disturbed sample at 0.7m

3: No seepage

4:

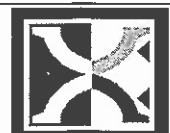
MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM05
X COORD: 2841229
Y COORD: 66510
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
		Medium dense, sandy GRAVEL. Dry, brown, with angular cobbles, hillwash.				
	0.4					
	0.5	Very soft rock QUARTZITE Completely weathered, pinkish white, very highly fractured, fractures are stained and very rough. Medium grained Magaliesberg Quartzite. Refusal on soft rock quartzite				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM06
X COORD: 2840934
Y COORD: 66571
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
		Medium dense to dense with depth, silty SAND. Dry, dark red mottled orange, residual structures discernible, ferruginised, residual diabase.				
	1.0	No refusal but dense, very slow going.				

NOTES 1: No DPL

2: No samples

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM07
X COORD: 2840955
Y COORD: 66669
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.4	Medium dense, silty SAND. Dry, brown, topsoil with roots.				
	1.5	Medium dense to dense, silty SAND. Slightly moist, dark red, transported.				
		No refusal but dense, very slow going.				

NOTES

- 1: No DPL
- 2: Disturbed sample at 700mm.
- 3: No seepage
- 4:

MACHINE: JCB 3CX

DATE PROFILED: 19-20 Sept 2005

DIAM: Test pit 0.6m wide, 2m long

PROFILED BY: fpp

FILE REF: c:\velavke\GP kameeldrift



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM08
X COORD: 2841046
Y COORD: 66592
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.3	Medium dense, silty SAND. Dry, brown, topsoil with roots.				
	1.0	Medium dense to dense, silty SAND. Dry, dark red mottled orange.				
	1.3	Medium dense to dense, silty SAND. Slightly moist, greenish light brown mottled orange, ferruginised residual diabase.				
		No refusal but dense, very slow going.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM09
X COORD: 2841034
Y COORD: 66456
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.5	Loose to medium dense, silty SAND. Dry, grey to white, transported.				
	1.5	Medium dense, silty SAND. Dry, grey mottled orange, residual structures discernable, ferruginised, residual diabase.				
		No refusal but dense.				

NOTES 1: No DPL

2: No samples

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM11
X COORD: 2841126
Y COORD: 66542
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
		Medium dense, silty SAND. Dry, light grey to white, transported.				
	1.0					
		Medium dense to dense, silty SAND. Dry, orange mottled white, ferruginised, transported?				
	1.6					
		No refusal but dense.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
PROFILED BY: fpp



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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM12
X COORD: 2841247
Y COORD: 66389
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	1.5	Medium dense, sandy GRAVEL with some cobbles. Dry, light orange mottled pinkish white, transported hillwash/talus, cobbles are angular up to 150mm, clast supported.				
		Very slow going on boulders, possibly residual diabase at base.				

NOTES 1: No DPL

2: No samples

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM13
X COORD: 2841174
Y COORD: 66326
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.2	Medium dense, silty SAND. Dry, light brown, topsoil with roots.				
	1.0	Medium dense to dense, silty SAND. Dry to slightly moist, red mottled orange, transported. Pebble Marker possibly at 1.0m.				
	1.4	Medium dense to dense, gravelly SAND. Slightly moist, yellowish brown mottled red, ferruginised residual diabase.				
		Slow going near refusal.				

NOTES 1: No DPL

2: No samples

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

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CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM14
X COORD: 2841253
Y COORD: 66241
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.2	Medium dense, silty SAND. Dry, light brown, topsoil with roots.				
	1.0	Dense, silty SAND. Slightly moist, orangy red, transported.				
		Refusal on calcretised diabase boulder; very slow going from 300mm.				

NOTES 1: No DPL

2: Disturbed sample at 500mm

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

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TRIAL PIT LOG

CLIENT: CityScoop Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

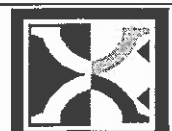
HOLE NO: KM15
X COORD: 2841387
Y COORD: 66347
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.4	Medium dense, sandy GRAVEL. Dry, brown, with angular cobbles, hillwash.				
	0.8	Very soft rock QUARTZITE Completely weathered, white, very highly fractured, fractures are stained and very rough. Medium grained Magaliesberg Quartzite.				
		Refusal on soft rock quartzite				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM16
X COORD: 2841326
Y COORD: 66715
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.3	Medium dense, silty SAND. Dry, light brown, topsoil with roots.				
	1.3	Medium dense to dense, silty SAND. Slightly moist, reddish orange mottled yellow, residual diabase.				
	1.4	Medium dense to dense, silty SAND. Slightly moist, yellowish brown mottled red, ferruginised residual diabase. Slow going near refusal.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM17
X COORD: 2841171
Y COORD: 66876
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
		Medium dense, sandy GRAVEL. Dry, brown, with angular cobbles, hillwash.				
	0.6	Refusal on soft rock quartzite				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM18
X COORD: 2841644
Y COORD: 66462
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.3	Medium dense, silty SAND. Dry, light brown, topsoil with roots.				
	1.0	Medium dense, silty SAND. Dry, red, transported. Pebble marker at 1000mm.				
	1.6	Medium dense, gravelly SAND. Dry, red mottled yellow, residual diabase.				
	2.0	Very soft rock DIABASE. Completely weathered, yellowish light brown, highly fractured. Friable, breaks down to a silty fine sand.				
		Refusal on soft rock diabase.				

NOTES 1: No DPL

2: Disturbed sample at 0.5m

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM19
X COORD: 2841540
Y COORD: 66419
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.2	Medium dense, silty SAND with some gravel. Dry, light brown, topsoil with roots.				
	0.5	Very soft rock DIABASE. Highly weathered, yellowish light brown, highly fractured, fractures are stained black. Friable, breaks down to a silty, fine sand.				
		Very slow going on soft rock diabase, near refusal.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM20
X COORD: 2841538
Y COORD: 66543
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
		0.0 Ground Surface				
		0.2 Medium dense, silty SAND with some gravel. Dry, light brown, topsoil with roots.				
		0.6 Medium dense, gravelly SAND. Dry, red mottled yellow, residual diabase.				
		0.8 Very soft rock DIABASE. Highly weathered, yellowish light brown, highly fractured, fractures are stained black. Friable, breaks down to a silty, fine sand. Refusal on soft rock diabase.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM21
X COORD: 2841486
Y COORD: 66600
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.4	Medium dense, sandy GRAVEL. Dry, brown, with angular cobbles, hillwash.				
	0.8	Very soft rock QUARTZITE Completely weathered, pinkish white, very highly fractured, fractures are stained and very rough. Medium grained Magaliesberg Quartzite.				
		Refusal on soft rock quartzite				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM22
X COORD: 2841158
Y COORD: 66967
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.2	Medium dense, silty SAND with some gravel. Dry, light brown, topsoil with roots.				
		Medium dense, silty SAND. Dry, red, transported.				
	DS					
	US					
	1.9					
	2.0	Very soft rock DIABASE. Highly weathered, yellowish light brown, highly fractured, fractures are stained black. Friable, breaks down to a silty, fine sand. Refusal on soft rock diabase.				

NOTES 1: No DPL

2: Disturbed sample at 500mm, undisturbed sample at 1000mm

3: No seepage

4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM23
X COORD: 2841146
Y COORD: 67065
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
	0.0	Ground Surface				
	0.2	Medium dense, silty SAND. Dry, light brown, topsoil with roots.				
		Medium dense, silty SAND. Dry, red, transported.				
	1.8	Refusal on boulders of soft rock diabase.				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM24
X COORD: 2841379
Y COORD: 67100
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
		0.0 Ground Surface				
		0.3 Medium dense, sandy GRAVEL. Dry, brown, with angular cobbles, hillwash.				
		0.5 Very soft rock QUARTZITE Completely weathered, pink speckled white, very highly fractured, fractures are stained and very rough. Medium grained Magaliesberg Quartzite. Refusal on soft rock quartzite				

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
PROFILED BY: fpp



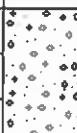
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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM25
X COORD: 2841264
Y COORD: 67189
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
		0.0 Ground Surface				
		0.3 Medium dense, sandy GRAVEL. Dry, brown, with angular cobbles, hillwash.				
		0.5 Very soft rock QUARTZITE Completely weathered, pink speckled white, very highly fractured, fractures are stained and very rough. Medium grained Magaliesberg Quartzite. Refusal on soft rock quartzite				

NOTES

- 1: No DPL
- 2: No samples
- 3: No seepage
- 4:

MACHINE: JCB 3CX

DIAM: Test pit 0.6m wide, 2m long

FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005

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TRIAL PIT LOG

CLIENT: CityScope Townplanners
PROJECT: KAMEELDRIFT
PROJECT NO: PJ091/KJ

HOLE NO: KM26
X COORD: 2841173
Y COORD: 67261
ELEVATION:
PAGE 1 of 1

Depth		Description	Dynamic Probe Light Equivalent SPT-N			
			10	20	30	40
		0.0	Ground Surface			
		0.3	Medium dense, silty SAND with some gravel. Dry, brown, with subangular cobbles, topsoil with roots.			
		0.8	Medium dense to dense, silty SAND. Dry, red, transported.			
		1.4	Very soft rock DIABASE Highly weathered, light brown mottled orange, highly fractured, fractures are stained black.			
			No refusal, very slow going on diabase.			

NOTES 1: No DPL
2: No samples
3: No seepage
4:

MACHINE: JCB 3CX
DIAM: Test pit 0.6m wide, 2m long
FILE REF: c:\velavke\GP kameeldrift

DATE PROFILED: 19-20 Sept 2005
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Appendix

B

Logging Parameters

1. SOIL DESCRIPTIVE TERMS

DESCRIPTIVE ORDER:

1. CONSISTENCY 2. SOIL TYPE 3. MOISTURE CONDITION 4. COLOUR 5. SOIL STRUCTURE 6. ORIGIN

1.(a) CONSISTENCY: GRANULAR SOILS

S P T "N"	GRAVELS & SANDS Generally free draining soils		TYPICAL 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 LOOSE	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 of pick for excavation	1750-1925
> 50	VERY DENSE	High resistance to repeated blows of geological pick. Requires power tools for excavation	> 1925

1(b) CONSISTENCY: COHESIVE SOILS

S P T "N"	SILTS & CLAYS and combination 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 30-40mm. Moulded by fingers with some pressure. Easily penetrated by thumb.	50-125
4-8	FIRM	Pick point penetrates up to 10mm. Very difficult to mould with fingers. Indented by thumb with effort. Spade just penetrates.	125-500
8-15	STIFF	Slight indentation by pushing in pick point. Cannot be moulded by fingers. Penetrated by thumbnail. Pick necessary to excavate.	250-500
15-30	VERY STIFF	Slight indentation by blow of pick point.. Requires power tools for excavation.	500-1000

2. SOIL TYPE

SOIL TYPE	PARTICLE SIZE (mm)
CLAY	< 0.002
SILT	0.002 – 0.06
SAND	0.06 – 2
GRAVEL	2 – 60*
COBBLES	60 – 200*
BOULDERS	> 200*

* Specify aver/max sizes, hardness, shape and proportion

4. COLOUR

Described at natural moisture content, as seen in profile (unless otherwise specified).

SPECKLED	Very small patches of colour < 2 mm
MOTTLED	Irregular patches of colour 2 – 6 mm
BLOTCHED	Large irregular patches 6 – 20 mm
BANDED	Approximately parallel bands of varying colour
STREAKED	Randomly orientated streaks of colour
STAINED	Local colour variations; associated with discontinuity surfaces
Described using bedding thickness criteria. (e.g. thickly banded, thinly streaked, etc.)	

3. MOISTURE CONDITION

DRY	No water detectable
SLIGHTLY MOIST	Water just discernable
MOIST	Water easily discernable
VERY MOIST	Water can be squeezed out
WET	Generally below the water table

5. 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 breaks into gravel size blocks
MICRO-SHATTERED	Small scale shattering, very closely spaced open fissures. Soil breaks into sand size crumbs
RESIDUAL STRUCTURES	Relict bedding, lamination, foliation, etc.

6. ORIGIN

TRANSPORTED	Alluvium, hillwash, talus, etc.
RESIDUAL	Weathered from parent rock e.g. residual granite
PEDOCRETES	Ferricrete, laterite, silcrete, calcrete, etc.

DEGREE OF CEMENTATION OF PEDOCRETES		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 disintegrates to friable state.	0.5 – 2
CEMENTED	Material crumbles under firm blows of sharp pick point. Grains can be dislodged with some difficulty by a knife blade.	2 – 5
STRONGLY CEMENTED	Firm blows of sharp pick point on hand-held specimen show 1-3mm indentations. Grains cannot be dislodged by knife blade.	5 – 10
VERY STRONGLY CEMENTED	Hand-held specimen can be broken by single firm blow of hammerhead. Similar appearance to concrete.	10 - 25



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2. ROCK DESCRIPTIVE TERMS

DESCRIPTIVE ORDER: 1. HARDNESS 2. ROCK TYPE 3. WEATHERING 4. COLOUR 5. FRACTURE SPACING
6. DISCONTINUITY SURFACE DESCRIPTION 7. GRAIN SIZE 8. ROCK FORMATION NAME

1. ROCK HARDNESS

HARDNESS	DESCRIPTION	UCS (MPa)
VERY SOFT	Material crumbles under firm blows of pick point. Can be peeled with a knife. SPT refusal. Too hard to cut triaxial sample by hand	1 - 3
SOFT ROCK	Firm blows with pick point: 2-4mm indents. Can just be scraped with a knife	3 - 10
MEDIUM HARD ROCK	Firm blows of pick head will break hand-held specimen. Cannot be scraped or peeled with a knife.	10 - 25

HARDNESS	DESCRIPTION	UCS (MPa)
HARD ROCK	Breaks with difficulty, rings when struck Point load or laboratory test results necessary to distinguish between categories	25 - 70
VERY HARD ROCK		70 - 200
VERY VERY HARD ROCK		> 200

2. ROCK TYPE

Quartzite, sandstone, granite, limestone, etc.

4. COLOUR

Described in the dry state unless otherwise indicated

3. WEATHERING

DEGREE OF WEATHERING	EXTENT OF DISCOLOURATION	FRACTURE CONDITION	SURFACE CHARACTERISTICS	ORIGINAL FABRIC	GRAIN BOUNDARY CONDITION
UNWEATHERED	None	Closed or stained	Unchanged	Preserved	Tight
SLIGHTLY WEATHERED	< 20% of fracture spacing on both sides of fracture	Discoloured, may contain thin filling	Partial discolouration. Often unweathered rock colour	Preserved	Tight
MODERATELY WEATHERED	>20% of fracture spacing on both side of fracture	Discoloured, may contain thick filling	Partial to complete discolouration. Not friable except poorly cemented rocks	Preserved	Partial opening
HIGHLY WEATHERED	Throughout	-	Friable, pitted	Mainly preserved	Partial separation. Not easily indented with knife. Does not slake
COMPLETELY WEATHERED	Throughout	-	Resembles a soil	Partially preserved	Complete separation. Easily indented with knife. Slakes

5. DISCONTINUITY SPACING

SEPARATION (mm)	SPACING (foliation, cleavage, bedding, etc.)	SPACING (fractures, joints, etc.)
< 6	very intensely	very highly
6 - 20	intensely	
20 - 60	very thinly	highly
60 - 200	thinly	
200 - 600	medium	moderately
600 - 2000	thickly	slightly
> 2000	very thickly	very slightly

6. DISCONTINUITY SURFACE DESCRIPTION

6.1 JOINT FILLING

JOINT FILL TYPE	DEFINITION (wall separation specified in mm)
CLEAN	No fracture filling
STAINED	Colouration of rock only. No recognisable filling material
FILLED	Fracture filled with finite thickness filling material

6.2 DISCONTINUITY ORIENTATION

Discontinuity inclinations (i.e. of joints, bedding, faults)

6.3 ROUGHNESS OF DISCONTINUITY PLANES

CLASSIFICATION	DESCRIPTION
SMOOTH	Appears smooth and is essentially smooth to the touch. May be slickensided *
SLIGHTLY ROUGH	Asperities on the fracture surface are visible and can be distinctly felt
MEDIUM ROUGH	Asperities are clearly visible and fracture surface feels abrasive
ROUGH	Large angular asperities can be seen. Some ridge and high side angle steps evident
VERY ROUGH	Near vertical steps and ridges occur on the fracture surface

* Where slickensides occur the direction of the slickensides should be recorded

7. GRAIN SIZE

CLASSIFICATION	SIZE (mm)	RECOGNITION
VERY FINE GRAINED	< 0.2	Individual grains cannot be seen with a hand lens
FINE GRAINED	0.2 - 0.6	Just visible as individual grains under hand lens
MEDIUM GRAINED	0.6 - 2	Grains clearly visible under hand lens, just visible to the naked eye
COARSE GRAINED	2 - 6	Grains clearly visible to the naked eye
VERY COARSE GRAINED	> 6	Grains measurable

8. ROCK FORMATION

Brixton Formation, Halfway House Granite Dome etc.

REFERENCE: Guide to Core Logging for Civil Engineering Purposes (1993)



Appendix

C

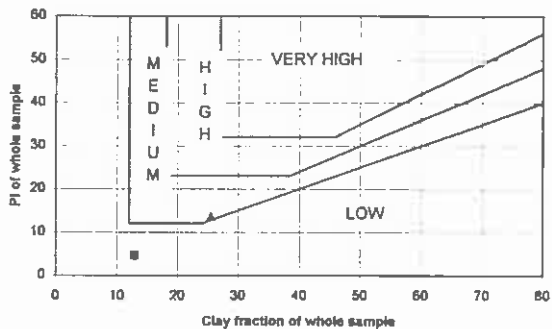
Laboratory Test Results

PARTICLE SIZE ANALYSIS

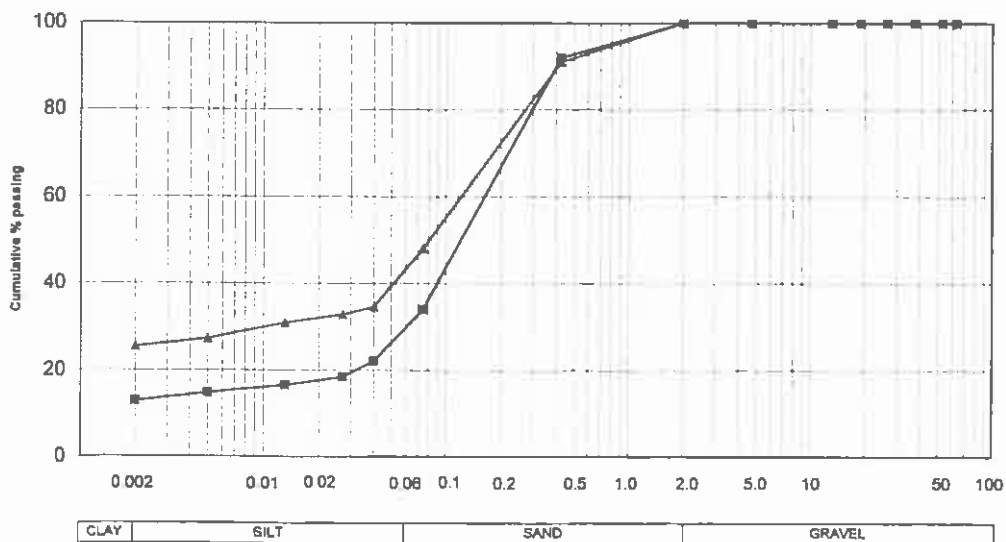
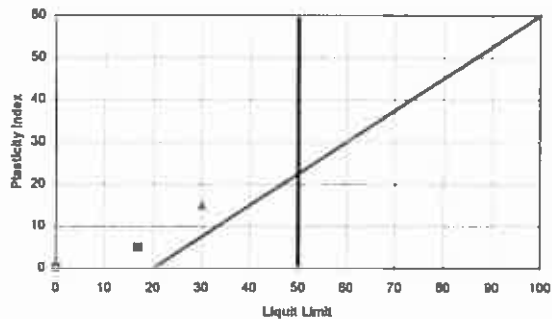
Sample No	18688	18689
Soillab sample no	S05-0665A-01	S05-0665A-02
Position	KM04	KM07
Depth (m)	0.7	0.7
Material Description	DARK RED SILTY SAND	DARK Y/O CLAYEY SAND
Moisture (%)		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	100
4.75 mm	100	100
2.00 mm	100	100
0.425 mm	92	91
0.075 mm	34	48
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	22	35
0.027 mm	18	33
0.013 mm	17	31
0.005 mm	15	27
0.002 mm	13	25
% Clay	13	25
% Silt	16	17
% Sand	71	58
% Gravel	0	0
ATTERBERG LIMITS		
Liquid Limit	17	30
Plasticity Index	5	15
Linear Shrinkage (%)	2.0	8.5
Grading Modulus	0.74	0.81
Classification	A-2-4 (0)	A-8 (4)
Unified Classification	SP & SC	SC
Chart Reference	■-■-■	▲-▲-▲

PROJECT : BAVIAANSPOORT TOWN
JOB No : S05-0665A
DATE : 2005-10-20

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



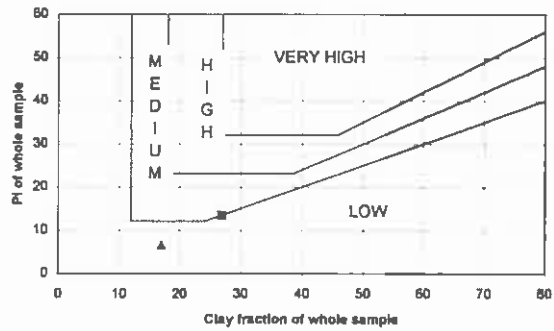
HYDROMETER0665A-01

PARTICLE SIZE ANALYSIS

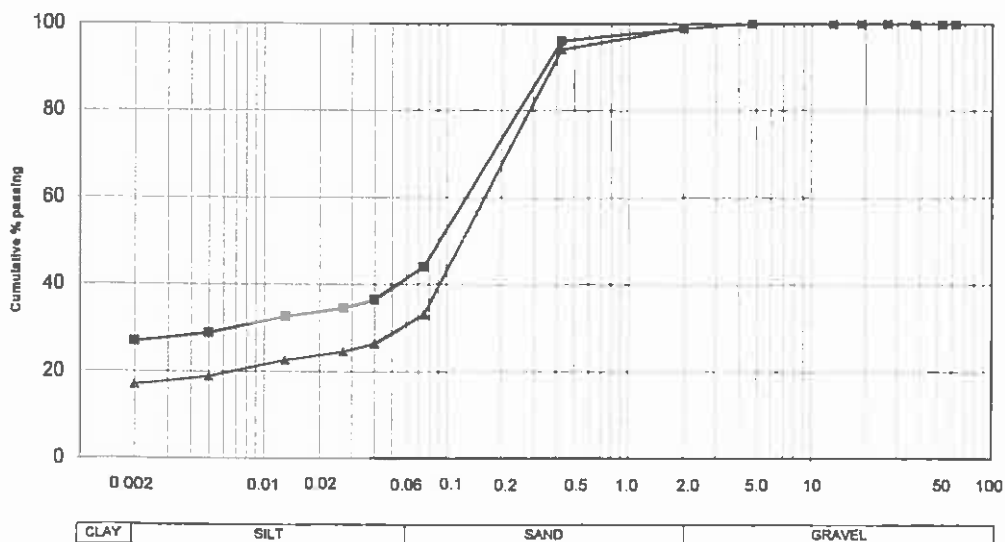
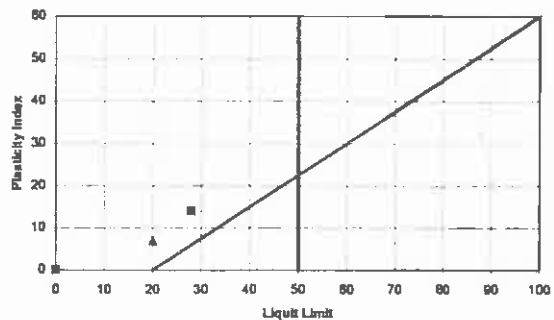
Sample No.	18690	18691
Soillab sample no	S05-0665A-03	S05-0665A-04
Position	KM14	KM18
Depth (m)	0.5	0.5
Material Description	DARK RED CLAYEY SAND	LIGHT RED CLAYEY SAND
Moisture (%)		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	100
4.75 mm	100	100
2.00 mm	99	99
0.425 mm	96	94
0.075 mm	44	33
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	38	26
0.027 mm	35	24
0.013 mm	33	23
0.005 mm	29	19
0.002 mm	27	17
% Clay	27	17
% Silt	14	13
% Sand	58	69
% Gravel	1	1
ATTERBERG LIMITS		
Liquid Limit	28	20
Plasticity Index	14	7
Linear Shrinkage (%)	6.0	3.0
Grading Modulus	0.61	0.74
Classification	A-6 (3)	A-2-4 (0)
Unified Classification	SC	SP & SC
Chart Reference	■—■	▲—▲

PROJECT : BAVIAANSPOORT TOWN
JOB No S05-0665A
DATE 2005-10-20

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



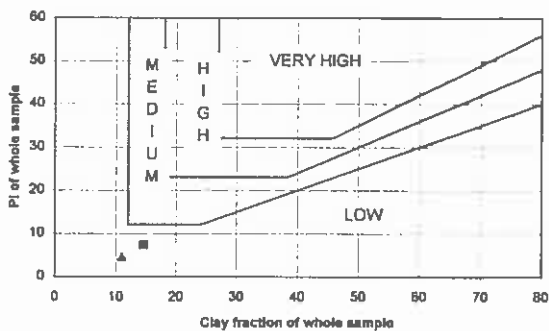
HYDROMETER 0665A-02

PARTICLE SIZE ANALYSIS

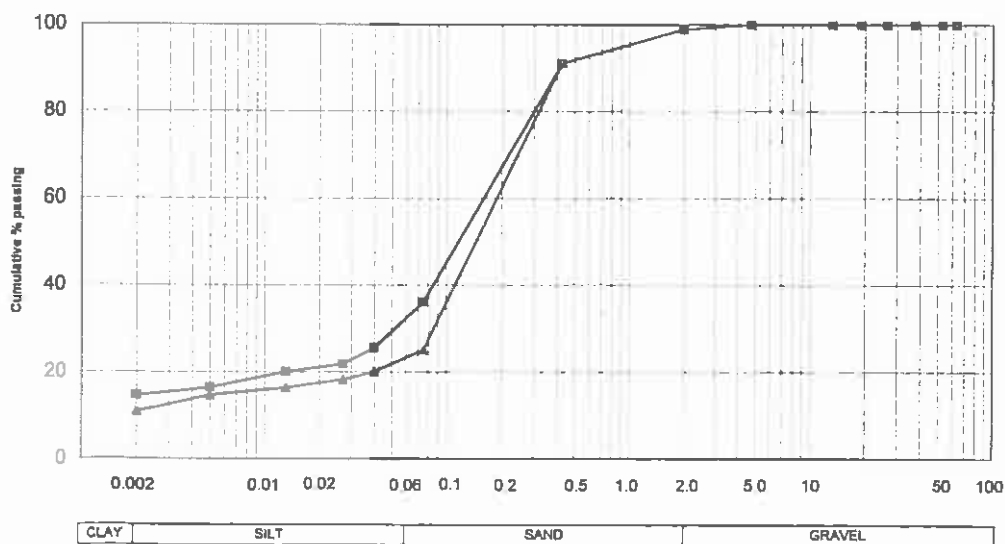
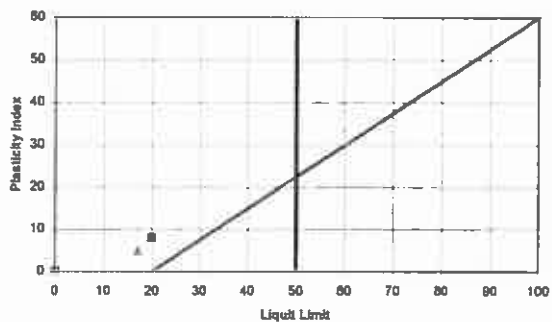
Sample No	18692	18693
Soillab sample no	S05-0665A-05	S05-0665A-06
Position	KM22	KM22
Depth (m)	1.0	0.5
Material Description	DARK RED SILTY SAND	LIGHT RED SILTY SAND
Moisture (%)		
SCREEN ANALYSIS (% PASSING)		
63.0 mm	100	100
53.0 mm	100	100
37.5 mm	100	100
26.5 mm	100	100
19.0 mm	100	100
13.2 mm	100	100
4.75 mm	100	100
2.00 mm	99	99
0.425 mm	91	91
0.075 mm	36	25
HYDROMETER ANALYSIS (% PASSING)		
0.040 mm	25	20
0.027 mm	22	18
0.013 mm	20	16
0.005 mm	16	15
0.002 mm	15	11
% Clay	15	11
% Silt	17	12
% Sand	68	76
% Gravel	1	1
ATTERBERG LIMITS		
Liquid Limit	20	17
Plasticity Index	8	5
Linear Shrinkage (%)	3.0	1.5
Grading Modulus	0.74	0.85
Classification	A-4 (0)	A-2-4 (0)
Unified Classification	SC	SP & SC
Chart Reference	■—■	▲—▲

PROJECT : BAVIAANSPOORT TOWN
JOB No S05-0665A
DATE 2005-10-20

POTENTIAL EXPANSIVENESS



PLASTICITY CHART



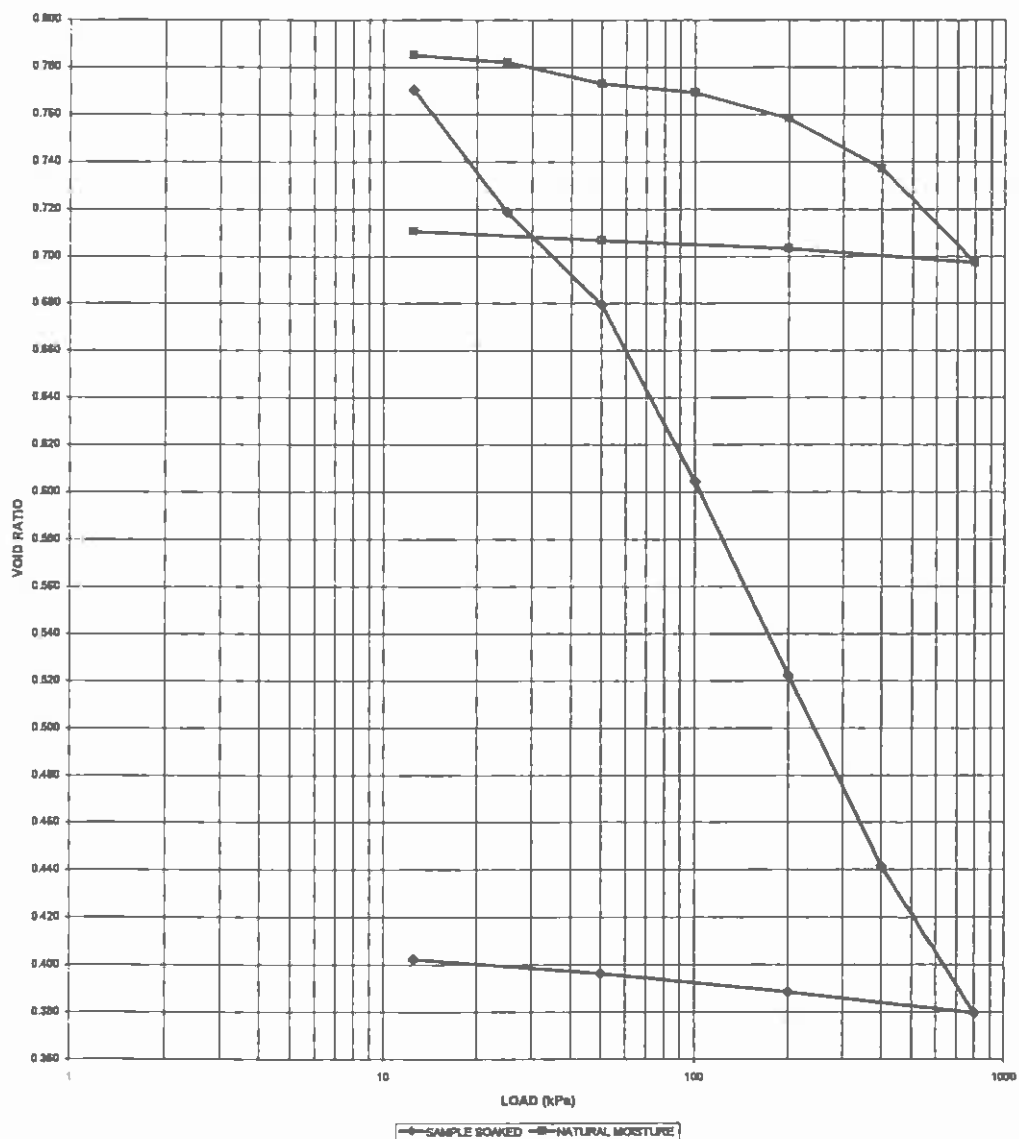
HYDROMETER/0665A-03

DOUBLE CONSOLIDATION TEST

PROJECT	BAVIAANSPOORT TOWN	INITIAL DRY DENSITY (kg/m ³)	1469
SAMPLE NO	822	INITIAL MOISTURE CONTENT (%)	4.0 13.3
DEPTH (m)	1.0	MOISTURE CONTENT AFTER TEST (%)	14.9 2.5
INITIAL HEIGHT OF SAMPLE (mm)	19.4	RELATIVE DENSITY	2.649
SAMPLE STATE	UNDISTURBED	INITIAL VOID RATIO	0.803
SOILLAB SAMPLE No	S05-865A-05	VOID RATIO AFTER SOAKING	0.803

LOAD (kPa)	0	W	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm)	19.40	19.40	19.05	18.49	18.07	17.26	16.38	15.51	14.84	14.84	15.03	15.09
VOID RATIO	0.803	0.803	0.770	0.719	0.679	0.604	0.522	0.441	0.379	0.369	0.398	0.402

LOAD (kPa)	0	12.5	25	50	100	200	400	800	200	50	12.5
HEIGHT (mm)	19.30	19.11	19.08	18.98	18.84	18.82	18.59	18.17	18.23	18.27	18.31
VOID RATIO	0.803	0.785	0.782	0.773	0.769	0.758	0.737	0.697	0.703	0.707	0.710



KONSKONSOLIDASIE-DUBBEL0665A-01

TEST REPORT: S05-0665A

Page 5 of 5

Appendix



Photographs



PHOTO 1. Trial pit profile, taken at KM2



PHOTO 2. Trial pit profile, taken at KM9



PHOTO 3. Trial pit profile, taken at KM15

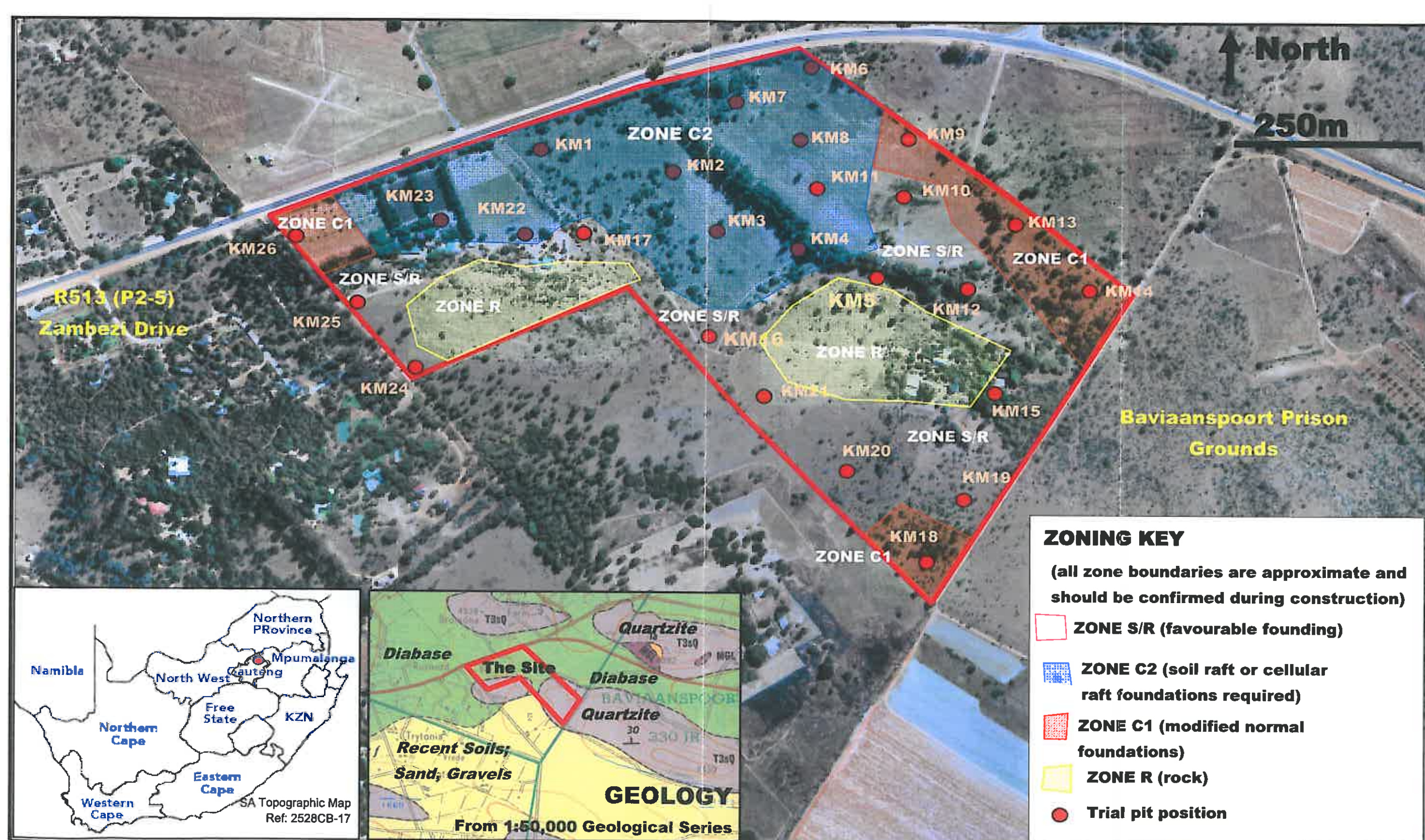


PHOTO 4. Trial pit profile, taken at KM26

FIGURE 1

**Geotechnical Investigation for
Portions R/9, 154, 454, 455 & 456, Kameeldrift**

Trial Pit Positions and Geotechnical Classification .



**PORTIONS R/9, 154, 454, 455 & 456
Kameeldrift, PRETORIA**

SITE LOCATION PLAN
TRIAL PIT POSITIONS AND
GEOTECHNICAL CLASSIFICATION

Figure No. 1

Drawn: FPP

Scale: Not to scale

Checked: AS

Report No.

Date: Nov 2005

PJ091/KJ/2005/11/2057



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