

REG No: 2004-050201 / 23

DIGES

DYNAMIC INTEGRATED GEO-ENVIRONMENTAL SERVICES CC.

- Environmental Impact (EIA) / EMR, waste management, environmental risk assessment, etc.
- Geotechnical investigations: foundation design, soil mechanics, flood determination, etc.
- Geohydrological investigation, groundwater resource development, pump testing, water & drilling.

Tel/Fax: 015-297 7980

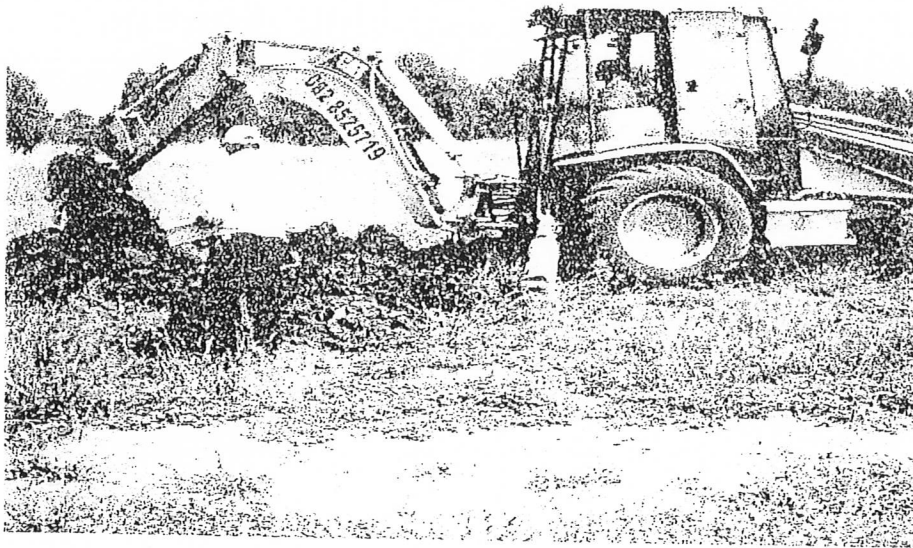
Cell: 072 523 7185

Cell: 072 468 3377

91 Hans van Rensburg street
Polokwane
0699
P.O. Box: 5743
Polokwane North
0750

TECHNICAL REPORT NO: IVY

Geotechnical Investigation for the Proposed Establishment of Portion 92 Ivydale of Polokwane Municipal Area Capricorn District, Limpopo Province.



GEOTECHNICAL INVESTIGATION PREPARED FOR KAMEKHO TOWN PLANNERS

Conducted on behalf of:

Kamekho Town Planners
109 Genl Muller Street
Polokwane
0699


For attention Mr Khosa

Tel: 015 297 2559

Fax: 015 297 3221

Cell: 083 490 2005

Compiled by:



Rambuwani R.V
B.sc Hons.Environmental Geology (UNIVEN.)
Consulting Engineering Geologist and Environmental Geologist
Pri Scie Nat Reg: 400161/06

PROJECT SUMMARY

An engineering geotechnical investigation was conducted at Ivydale Agricultural Holdings, Holding 92 South of Polokwane Town to the east of N1 to Gauteng in the Polokwane Municipal area of Capricorn District, Limpopo Province. The study was conducted in order to determine the suitability of the site with regard to proposed development of residential units. The investigation was based on the determination of mechanical properties of soil underlying the area, soil suitability with regards to the development, topography, slope, drainage and geological setting underlain the site.

According to the available geological information, the study area is underlain by leucocratic migmatite and gneiss, grey and pink hornblende-biotite gneiss, grey biotite gneiss; minor muscovite-bearing granite, megmatite gneiss of Hout River Gneiss. The site does not reflect any risk for the formation of sinkholes or subsidence caused by the presence of water-soluble rocks (dolomite or limestone), and no evidence of mining activity beneath the study area has been revealed.

The area is mostly covered by grass, herbs, sparsely thorny tress. No prominent geological structures deemed present within the boundary of the study area, only lineament inferred from aeromagnetic data showed on the geological map.

The area is deemed suitable for development of proposed residential development provided due cognisance given to , potential collapsible soil material found on mostly on top soil between 0 and 1 m, occasional presence of perched water tables and presence of potentially dispersive material prone to surface and sub-surface erosion. The area classifies as **C1** according to NHBRC.

This report details recommendations on soil excavation, slope stability, surface and underground drainage system and founding consideration. It is recommended that an engineering geologist inspect all founding trenches prior to construction in order to identify and evaluate any soil characteristics in variance with that found during investigation.

1	INTRODUCTION.....	2
1.1	General.....	2
1.2	TERMS OF REFERENCE	2
1.3	SCALE OF THE INVESTIGATION	2
1.4	Study locality	3
1.5	SOURCES OF INFORMATION	3
2	SITE DESCRIPTION.....	4
2.1	TOPOGRAPHY	4
2.2	DRAINAGE	4
2.3	CLIMATE	4
2.4	VEGETATION	4
2.5	GEOLOGICAL CONDITIONS	5
2.5.1	Lithostratigraphy.....	5
2.5.2	Geological lineament.....	5
3	TECHNIQUES EMPLOYED.....	6
3.1	DESK STUDY	6
3.2	FIELD WORK	6
3.2.1	Geotechnical surveys.....	6
4.4	REPORTING	7
4	RESULTS.....	8
4.1	GEOTECHNICAL ASPECTS	8
4.1.1	General.....	8
4.1.2	Walk over survey.....	9
4.1.3	General Engineering Geological Factors.....	9
4.1.4	General soil profile observed in the field.....	10
5	AREA POTENTIAL EVALUATION.....	13
5.1	GENERAL	13
5.2	Site classification	13
5.3	DETAILED SITE SUITABILITY EVALUATION	14
5.3.1	General soil excavatability.....	14
5.3.2	Undulation immovability.....	14
5.3.3	Surface and underground drainage.....	14
5.3.4	Environmental health concerns.....	15
5.3.5	Founding Consideration.....	15
6	CONCLUSIONS AND RECOMMENDATION.....	16
7	BIBLIOGRAPHY.....	18

List of Figures

FIGURE 1 **Locality map**

1 INTRODUCTION

1.1 GENERAL

An engineering geotechnical investigation was conducted on Holding 92 of Ivydale Agricultural Holding to the south of Polokwane Town east of N1 to Gauteng of Polokwane Municipality Capricorn District Municipality Limpopo Province in order to determine the suitability of the site with regard to the proposed development of residential development. The investigation was based on mechanical properties of soil and rock material underlying the site, soil suitability, slope stability, topography, drainage system as well as geological setting with regard to the proposed development.

1.2 TERMS OF REFERENCE

The investigation was requested by Mr Justice Khosa of Messrs Kamekho Town Planners as confirmed by the letter of appointment dated 4 of August 2006; Kamekho Town Planners is an implementing agent on behalf of the proposed developer of residential development at Ivydale.

1.3 SCALE OF THE INVESTIGATION

The investigation had the following aims:

- to determine the mechanical properties of the soil underlying the area
- to determine and evaluate the regional geological character of the study area
- to determine regional soil suitability covering the site
- to recommend necessary precautionary measures during design and construction.

1.4 STUDY LOCALITY

The study area is located to the south of new Ivy Park, within Polokwane Municipality a 1.5 km to the east of N1 to Gauteng. Three houses on the side and new Botas Church to the west.

The site is located in the following co-ordinates: -24.99039
29.08647

1.5 SOURCES OF INFORMATION

The following sources of information were used during the investigation:

- **Geological maps**

- Geological map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland, 1997; scale 1: 1 000 000.
- 2328 Pietersburg, 1985; scale 1: 250 000.

- **Topographical maps**

- 2329 CD Pietersburg, Second Edition, 1983(1997), Scale 1:50 000, South Africa.

2 SITE DESCRIPTION

2.1 TOPOGRAPHY

The study area is located on a gentle to flat slope, with slope draped towards the north and south on the other side. The area exhibits an average slope of between 1° and 1.5° west. No prominent regional topographical features occur within the boundaries of the study area.

2.2 DRAINAGE

The study area is located in the Limpopo Catchment Management Area.

The site is drained by means of surface run off, with storm water collecting towards the south and north of the site. No prominent surface drainage features are developed within the property boundaries. No stream was noticed within the vicinity of the proposed area.

2.3 CLIMATE

The study area is located in the summer rainfall region of South Africa, with an annual rainfall of approximately 400-500 mm, as measured at Pietersburg Hospital weather station; Midgley *et al*, 1994). The climatic N-value (Weinert, 1980) of the area is deemed to be between 3 and 4; therefore chemical disintegration, rather than mechanical disintegration, of the parent rocks is deemed the principal mode of weathering.

2.4 VEGETATION

The area is covered mostly by grass, herbs, sparsely thorny tree.

2.5 GEOLOGICAL CONDITIONS

2.5.1 Lithostratigraphy

According to the available geological information, the study area is underlain by leucocratic migmatite and gneiss, grey and pink hornblende-biotite gneiss, grey biotite gneiss; minor muscovite-bearing granite, pegmatite and gneiss of the Hout River Gneiss.

The site does not reflect any risk for the formation of sinkholes or subsidence caused by the presence of water-soluble rocks (dolomite or limestone), and no evidence of mining activity beneath the study area has been revealed

2.5.2 Geological lineament

No prominent geological structures deemed present in the area of study as confirmed by aeromagnetic data.

3 TECHNIQUES EMPLOYED

3.1 DESK STUDY

The investigation commenced with the conducting of the following actions:

- the collation and evaluation of available geological, geotechnical and hydrogeological information
- the stereoscopic examination of aerial photographs to delineate obvious topographical and soil variations
- a slope analysis to delineate areas with either steep to very steep or very gentle slopes
- the compilation of base map showing identified land forms, regional geological setting and soils classification

This information was collated into a Planning Report detailing all results to date, and a Base Map indicating the planned positions for actions to be taken during the field work phase of the investigation.

The desk study phase was completed with a site inspection during which the accuracy and relevancy of the available information were evaluated.

3.2 FIELD WORK

3.2.1 Geotechnical surveys

Walk over survey within the site was done during site visit, slope stability were also assessed, geological setting and site drainage system, insitu soil assessment to determine field mechanical properties and its suitability in accordance with industrial standard proposed by Jennings *et al* (1973).

The following factors also taken into consideration during field visit: site suitability with respect to flood time, slope analysis.

4.4 REPORTING

The investigations conclude with the compilation of a technical engineering geotechnical report detailing all methodology utilised during the study and all results obtained. The report includes a detailed potential evaluation of the site with regard to the proposed development of housing, and includes a series of maps detailing the geological map.

4 RESULTS

4.1 GEOHYDROLOGICAL ASPECTS

4.1.1 General

The new National Water Act (Act 36 of 1998) describes groundwater as a part of a unitary, inter-dependant water cycle. Detailed study of the groundwater component should thus play a major part of the *ENVIRONMENTAL IMPACT ASSESSMENT* study and long-term monitoring of any site that may have an effect on the quality of a groundwater source.

4.1.2 Groundwater resources

Hydro census was conducted during site visit, and it was found that no boreholes drilled within the site, however neighbouring site were not visited as their gates were found locked. The Groundwater Information Programme of Water Affairs and Forestry (GRIP) were visited to find out if there are some boreholes in the immediate vicinity of the site. No boreholes were picked from the system.

4.1.3 Surface water resources

No prominent surface water resources or drainage features are developed within the property boundaries.

4.1.4 Community water supply

The development around the site uses bulk water from Polokwane Municipality. No boreholes usage was identified within the site.

4.2 GEOTECHNICAL ASPECTS

4.2.1 General

In accordance to National Homes Builders Registration Council (NHBRC), no development allowed within 1: 50 year flood line. The slope should not exceed 12° or more.

The area under investigation lies outside 1: 100 year flood line.

4.2.2 Walk over survey

Walk over survey done on the 6 August 2006, revealed the slope of between 1 and 1.5 ° towards the south and north of the site. Granite outcrops were noticed within the site and some ant hills were noticed within the proposed site. The type of soil observed on site was found being sandy clayey, dark brown in colour, coarse grained with quartz matrix of diameter more than 50mm, moderately collapsible, less dispersive soil which is less prone to erosion.

4.2.3 General Engineering Geological Factors

Below are the engineering geological parameters noted on site:

- *Excavatability*

No excavatability problem are foreseen during founding to a depth of less than 500mm, however excavatability problem are foreseen in depth of excess of 1 meter due to hard weathered Hout River Gneiss covering the site. No excavatability problems are foreseen during trenching of services lines in depth of less than 500mm.

- *Rocks and pedocrete outcrops*

Some granite rock outcrops noticed on site.

- *Groundwater seepage*

No groundwater seepage expected on site.

- *Backfilling*

The material covering the site expected to undergo a degree of densification, deemed to be indicative of a slightly compressible soil character.

4.2.4 General soil profile observed in the field

The description below based on the field observation and not actual laboratory test

The study area is covered by a layer of transported material covering the depth of between 0-500mm (deemed to represent hill wash) composed of light brownish in colour, high moisture content, loose, intact in some places, with quartz crystals diameter less than 50mm, moderately dense, gravel sand with little or no structure, few roots.

The hillwash is underlain by layer of pebble marker, containing pieces of pegmatite rock outcrops, loose to firm, irregular packed, jointed, fractured, with quartz crystals less than 50mm covering to a depth of between 500mm-700mm.

The pebble marker is underlain by residual granite with some minor glassy muscovite minerals, slightly weathered, less fractured, narrow joints, with loose soil like material between joints, no roots covering to depth of a meter. This layer covers a depth of between 1.2 -1.8m.

4.3 LABORATORY TESTS

4.3.1 Soil testing

Disturbed samples were taken from different soil horizons covering and underlying the site. The samples were submitted to MVL Lab (Polokwane) for the determination of the basic mechanical properties of the soil material covering the site. Detailed results are included as Appendix A.

The following results were obtained:

- Hillwash

The hillwash is composed of approximately 38 % sand, 27 % silt, 10 % clay, with 25% gravel. It must be noted that the vibratory compaction suitability number () of this material is greatly in excess of 30, which is indicative thereof that the hillwash is not suitable for *compaction by vibratory means*.

The hillwash classifies as sand clayey (*SC*) according to the A.S.T.M. standard on the Unified Soil Classification System, and as *A-1-a* material according to the soil classification system proposed by the American Association of State Highway and Transportation Officials (A.A.S.H.T.O.).

The fines fraction of the hillwash is deemed to be moderately plastic, with a liquid limit of approximately 10 %, a plasticity index of 8, a weighted plasticity index of 6.5 and a linear shrinkage of 6.9 %.

The hillwash has a calculated permeability of approximately 1×10^{-6} cm/s, translating to a percolation rate of approximately 0.0009 m/day, and as such classifies as being *very slightly permeable*.

In the light of the soil test results, the hillwash is deemed to be potentially moderately collapsible and compressible, due to its relatively unconsolidated nature and high volume of coarse particles, with an estimated differential settlement of 15 mm. The hillwash is not deemed to be potentially expansive.

- Granite characteristics

The granite is composed of approximately 56 % sand, 10 % silt, and 1 % clay, with up to 33 % gravel. It must be noted that the vibratory compaction suitability number of this material is less than 30, which is indicative thereof that the granite may be suitable for *compaction by vibratory means*.

The granite classifies as gravel *sandy GS* according to the A.S.T.M. standard on the Unified Soil Classification System, and as *A-2-4* material according to the soil classification system proposed by the American Association of State Highway and Transportation Officials (A.A.S.H.T.O.).

The fines fraction of the granite is deemed to be none plastic, material falls under G6 class good material for founding purposes.

The granite tested less dispersive.

The granite has a calculated permeability of approximately 5×10^{-3} cm/s, translating

to a percolation rate of approximately 0.006 m/day, and as such classifies as being moderately *permeable*.

In the light of the soil test results, the granite is deemed to be potentially moderately collapsible and compressible, due to its relatively unconsolidated nature and high volume of coarse particles, with an estimated differential settlement of 10 mm. The granite is not deemed to be potentially expansive.

- Reworked residual Granite

The reworked residual granite is composed of approximately 55 % gravel, 30 % sand, 10% silt, and 5 % clay. It must be noted that the vibratory compaction suitability number (I) of this material is greatly in excess of 30, which is indicative thereof that the pebble marker horizon is not suitable for *compaction by vibratory means*.

The reworked residual granite classifies as well to poorly *graded granite with biotite schist and sand (SP-SC)* according to the A.S.T.M. standard on the Unified Soil Classification System, and as *A-2-4* material according to the soil classification system proposed by the American Association of State Highway and Transportation Officials (A.A.S.H.T.O.).

The fines fraction of the residual granite is deemed to be none plastic, with grading modules of 1.2 and material falls within G5 material, suitable material for the development.

The reworked residual granite is tested none dispersive.

The reworked residual granite has a calculated permeability of approximately 5×10^{-3} cm/s, translating to a percolation rate of approximately 0.006 mm/hr, and as such classifies as being *moderately permeable*.

In the light of the soil test results, the reworked residual granite is deemed to be slightly compressible, due to its relatively unconsolidated nature and slight volume of coarse particles, with an estimated differential settlement of up to 5 mm. This material is not deemed to be potentially collapsible or expansive.

5 AREA POTENTIAL EVALUATION

5.1 GENERAL

The results of this study reveal that this site does not exhibit significant geological characteristics that will require the implementation of specific precautionary measures to reduce the risk of structural damage due to adverse geotechnical character.

The following options made with regard to proposed development:

- Double storey structure will be erected
- The average foundation load will not exceed 500kpa
- Lastly foundation will be constructed at a depth of between 0.3 and 0.45m beneath the natural ground surface.

5.2 SITE CLASSIFICATION

In the light of the result obtained during investigation, the whole site is deemed suitable with regard to proposed development, provided some cognisance taken during design and construction stage of development:

- The presence of slightly weathered granite noticed within the site may cause slight excavatability problem during installation of bulk services which may require special technique
- Presence of potentially collapsible material from the surface to depth of 500mm with an expected differential settlement of up to 10mm for the whole profile or less than 5mm for the material remaining beneath the foundations, may require specialised foundation design and construction techniques in some parts.
- The occasional presence of perched water tables at some point especial

after heavy rainfall events.

- The potential dispersive material prone to surface and subsurface erosion.

The area is classified as site Class C1 according to the system used by the National Home Builders Registration Council (NHBRC).

5.3 DETAILED SITE SUITABILITY EVALUATION

5.3.1 General soil excavatability

No excavatability problem are foreseen between 00 and 500mm by hand or light mechanical tool, however heavy mechanical tool will be required in depth of excess of meter due to hard or slightly weathered granite encountered on site.

5.3.2 Undulation immovability

No problem requiring special precautionary measures are foreseen with regard to the stability of the natural slopes on site. It must be noted that the gentle slope of the study area will limit the height of man-made cuttings during landscaping, thus limiting the collapse of these cuttings. It is, however, imperative that adequate sub-surface drainage be installed upstream of any retained cutting to prevent the build-up of moisture behind the face of retaining walls.

5.3.3 Surface and underground drainage

Due to occasional perched water tables at shallow depth at some point, an efficient surface drainage system should be put in place along all roads and around the building. As the surface drainage minimised the formation of seasonal perched water table, no need to implement underground drainage system.

5.3.4 Environmental health concerns

The sanitary type to be used is water borne system, therefore minimal groundwater pollution expected. Pits latrines will be constructed in shallow depth, due to hard solid granite bed rock, localised perched water table, relatively permeable soil cover.

It is recommend that on-site sanitation that do not rely on seepage for the disposal of liquid waste be erected for example ventilated pit latrines (vip), the enviroloo be used. The excavatability problems at depth may require that pits be built above ground or widened utilizing relatively impermeable material.

5.3.5 Founding Consideration

Due to the outcomes of this study, it is recommended that every foundation be excavated between 0.3 and 0.45 m.

If soil or mixture of soil and bed rocks underlies the foundation, it is recommended that modified normal foundation be used, utilizing reinforced strip footings with articulation joints at some internal and all external doors, and light reinforcement in masonry.

If bedrock is found to occur through out the entire foundation excavation, it is recommended that conventional strip footings or slab on the ground foundations be constructed directly on the bedrock, provided all soil pockets are removed.

6 CONCLUSIONS AND RECOMMENDATION

- An engineering geotechnical investigation was conducted on Holding 92 of Ivydale Agricultural Holding to the south of Polokwane Town east of N1 to Gauteng of Polokwane Municipality Capricorn District Municipality Limpopo Province in order to determine the suitability of the site with regard to the proposed development of townhouse. The investigation was based on mechanical properties of soil and rock material underlying the site, soil suitability, slope stability, topography, drainage system as well as geological setting with regard to the proposed development.
- According to the available geological information, the study area is underlain by leucocratic migmatite and gneiss, grey and pink hornblende-biotite gneiss, grey biotite gneiss; minor muscovite-bearing granite, pegmatite and gneiss of the Hout River Gneiss.
- The area is mostly covered by medium grass, herbs, rock outcrops, and thorny shrubs and sparsely acacia tress. No prominent geological structures deemed present within the boundary of the study area, only lineament inferred from aeromagnetic data showed on the geological map.
- The site does not reflect any risk for the formation of sinkholes or subsidence caused by the presence of water-soluble rocks, and no evidence of mining activity beneath the study area has been revealed.
- The area is deemed suitable for development of proposed residential development provided due cognisance given to slightly weathered granite at shallow depth, potential collapsible material from the top, occasional presence of perched water tables and presence of potentially dispersive material prone to surface and sub-surface erosion. The area classifies as **C1** according to NHBRC.

- It is recommended that conventional strip footings or slab on the foundation be used only if bedrocks occur when excavated between 0.3 and 0.45m; provide all soil pockets be removed prior to construction.
- It is also recommended that modified normal foundations be used, utilising reinforced strips footings with articulation joints at some internal and all external doors, and light reinforcement in masonry when the foundation is underlain by soil, or mixture of soil and bedrock when excavated between 0.3 and 0.45m.
- It is recommended that the loading foundation must not exceed 500kpa

7 BIBLIOGRAPHY

BYRNE, G, EVERETT, J P and SCHWARTZ, K, 1995.

A guide to practical geotechnical engineering in Southern Africa. Third Edition, Franki.

DEPARTMENT OF WATER AFFAIRS AND FORESTRY, 1997.

A protocol to manage the potential of groundwater contamination from on site sanitation. National Sanitation Co_ordination Office, Directorate of Geohydrology, Edition 1.

FISHER, G J, 1994.

The selection of cemetery sites in South Africa. Proceedings of the 4th Symposium on Terrain Evaluation and Data Storage, Midrand, August 1994.

LOW, A B and REBELO, A G, 1996.

Vegetation of South Africa, Lesotho and Swaziland. The Department of Environmental Affairs and Tourism.

MIDGLEY, D C, PITMAN, W V and MIDDLETON, B J, 1994.

Surface water resources of South Africa 1990, Book of Maps. Water Research Commission report number 298/1.2/94.

NATIONAL DATA BANK FOR ROADS, 1974.

List of descriptive land form terms for the naming of land facets. National Institute for Road Research, C.S.I.R., Pretoria.

SOUTH AFRICAN COMMITTEE FOR STRATIGRAPHY (SACS), 1980.

Stratigraphy of South Africa. Part 1 (Comp. L E Kent). Lithostratigraphy of the Republic of South Africa,

South West Africa/Namibia, and the Republics of Bophuthatswana, Transkei and

Venda. Handbook of the Geological Survey of South Africa, No. 8, Government Printer, Pretoria.

THORNBURY, W D, 1969.

Principles of geomorphology, second edition. John Wiley and Sons.

VISSER, D J L, 1989.

“Toeligting tot die 1 : 1 000 000 Geologiese Kaart _ vierde uitgawe, 1984: Die geologie van die Republieke van Suid_Afrika, Transkei en Bophuthatswana, Venda en Ciskei, en die Koninkryke van Lesotho en Swaziland”.

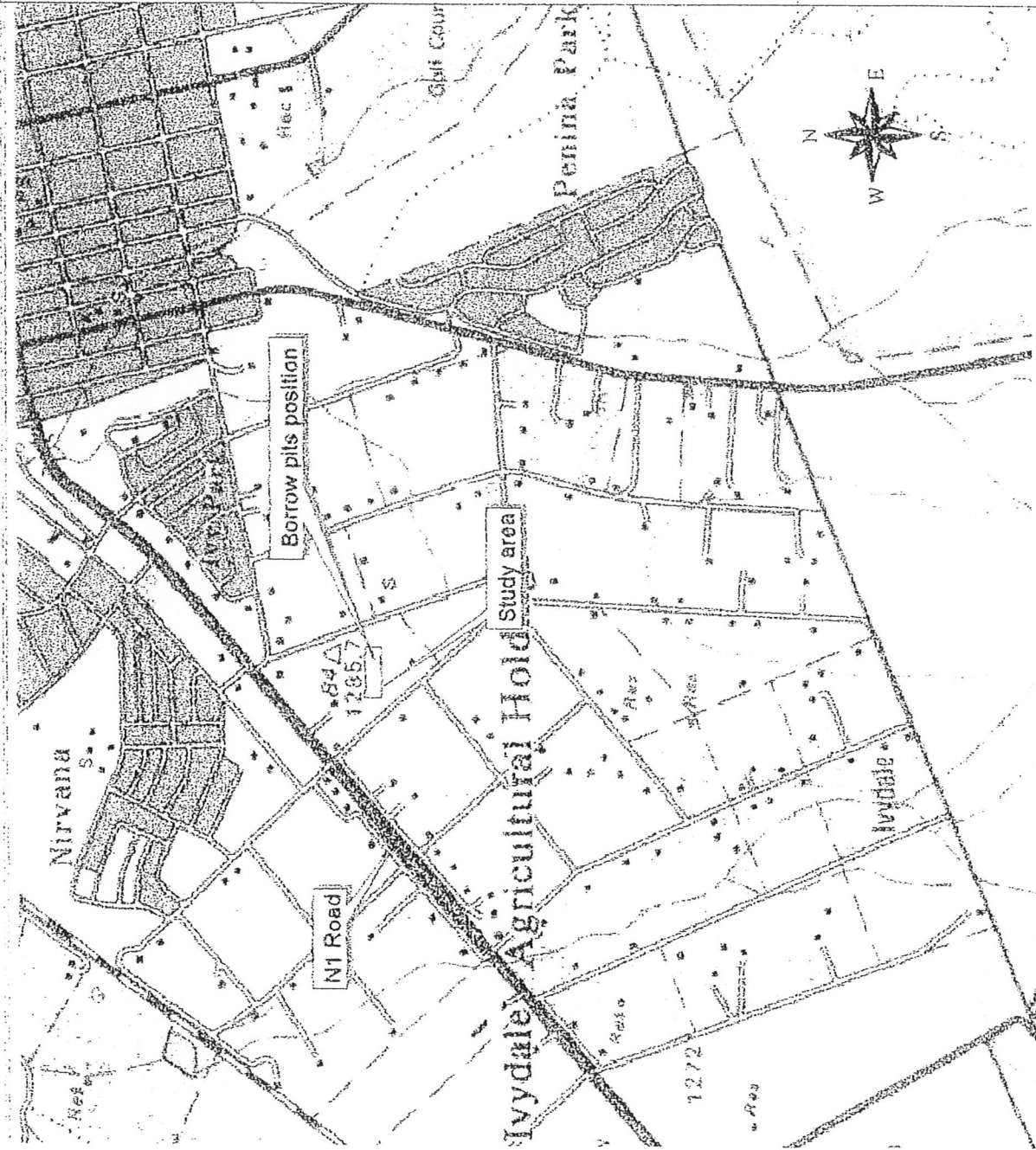
The Government Printer, Pretoria.

WEINERT, H H, 1980.

The natural road construction materials of Southern Africa. Academia, Cape Town.

MAP

TOPOGRAPHICAL MAP



Prepared by:
Dynamic Intergrated
Geo-Environmental
Services cc

Geo-Technical Investigation
for the establishment of a church
at Ivydale of Polokwane
Municipality,
Limpopo Province.

Prepared for:
Kamekho

Date: 18 August 2006

3 Kilometers

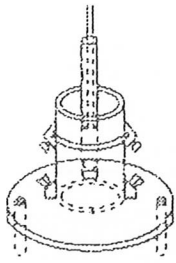
2

1

0

APPENDIX A

SOIL TEST RESULT



MVL LABORATORY SERVICES

Reg. No. CK2003/054847/23

PRETORIA OFFICE:
TECHNIKON PRETORIA
BUILDING 2C
STAATSATTELERIE RD
PRETORIA WEST

☎ 012 318 4122

CIVIL ENGINEERING MATERIALS LABORATORY
SIVIELE, INGENIEURSMATERIALE LABORATORIUM

☎ (015) 292 3937
FAX (015) 292 3024
Cell: 082 826 5623

2 KOBALT STREET
SUPERBIA, NIRVANA
P.O. BOX 2017
POLOKWANE
0700

OUR REF:8050/2

DATE: 18/08/2006

DIGES
P.O. BOX 5743
POLOKWANE NORTH
0750

ATTENTION : VINCENT

Dear Sir

re : IVYDALE TOWNSHIP ESTABLISHMENT

With the laboratory test results for above mentioned project, as requested by you.

HOLE No. / Km.	1	2	3	4
ROAD No.	IVYDALE	IVYDALE	IVYDALE	IVYDALE
DEPTH	1.0m	1.0m	1.0m	1.0m
SAMPLE No.	2006/1	2006/2	2006/3	2006/4
DESCRIPTION	Dark Grey Granite	Dark Olive Weathered Norite & Granite	Dark Olive Norite	Dark Olive Weathered Norite & Granite

SIEVE	75.0				
	63.0				
	53.0	100	100	100	100
	37.5	66	75	75	80
ANA -	26.5	58	68	65	74
	19.0	55	66	62	66
	13.2	48	59	54	62
	4.75	35	48	41	47
LYSIS	2.00	28	38	33	36
	0.425	21	26	21	22
	0.075	9	11	9	10

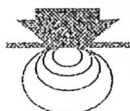
ATTER -	LL	22	26	25	23
ERG	P.I.	5	9	8	6
MIT	LS	2	4.0	3.7	2.0
	GM	2.43	2.25	2.37	2.32
CLASSIFI -	H.R.B.	A 1-a(0)	A-2-4(0)	A-2-4(0)	A-1-a(0)
CATION	T.R.H. 14				

MOD	OMC				
AASHTO	MDD				
	COMP. MC				
C.B.R.	% SWELL				
	100%				
	98%				
	97%				
U.C.S.	95%				
C.B.R.	93%				
	90%				
	STABILISED	NEAT	NEAT	NEAT	NEAT

Kind Regards

V.L. MOGOLANE (MANAGER)
MVL LABORATORY SERVICES

SAASIL



SAACEL

MEMBER: V.L. MOGOLANE

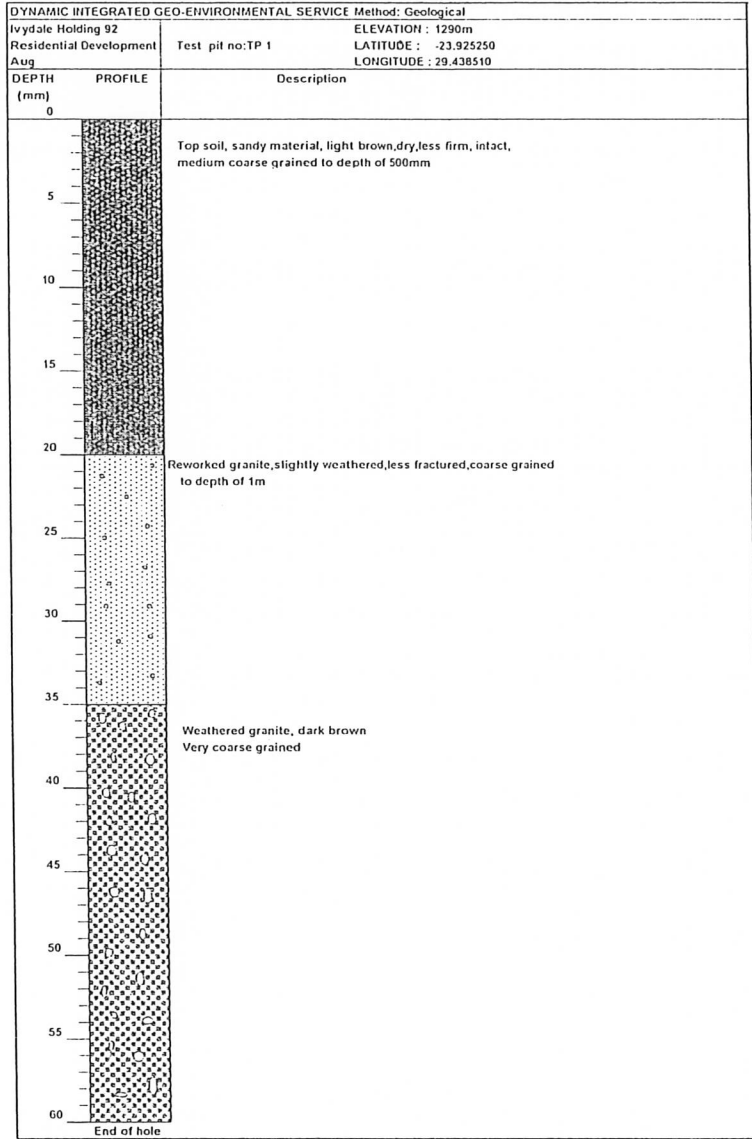
APPENDIX B

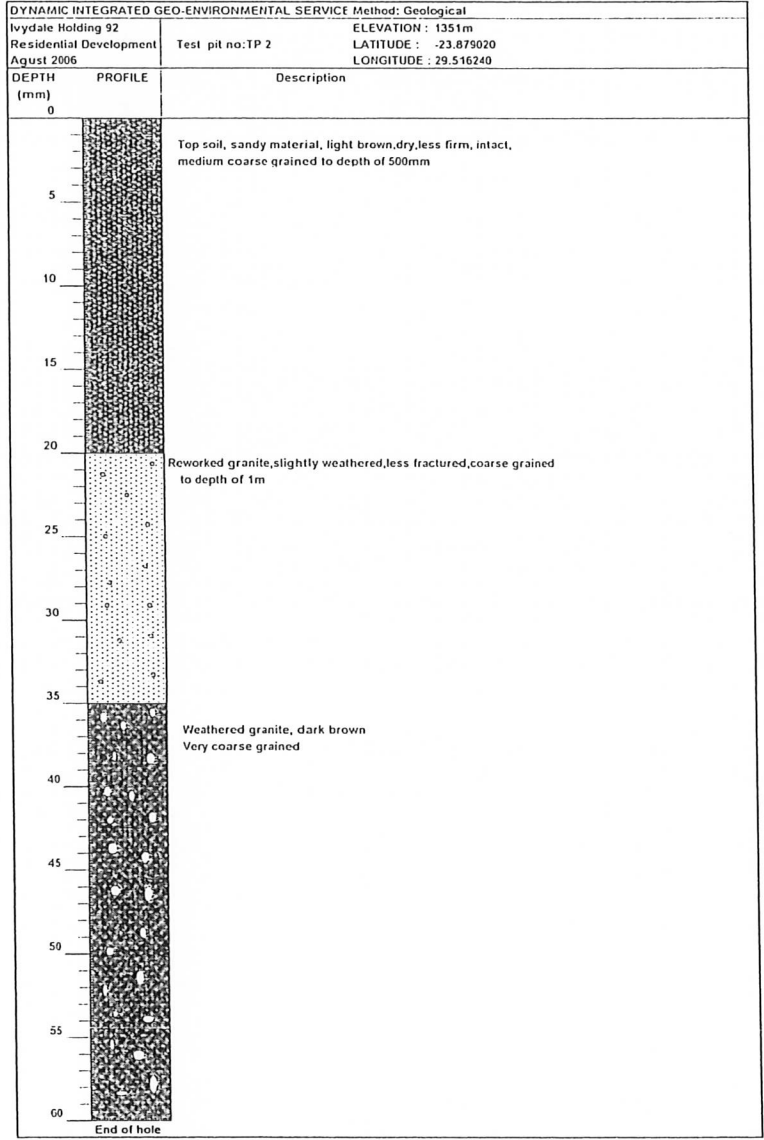
DESCRIPTION OF

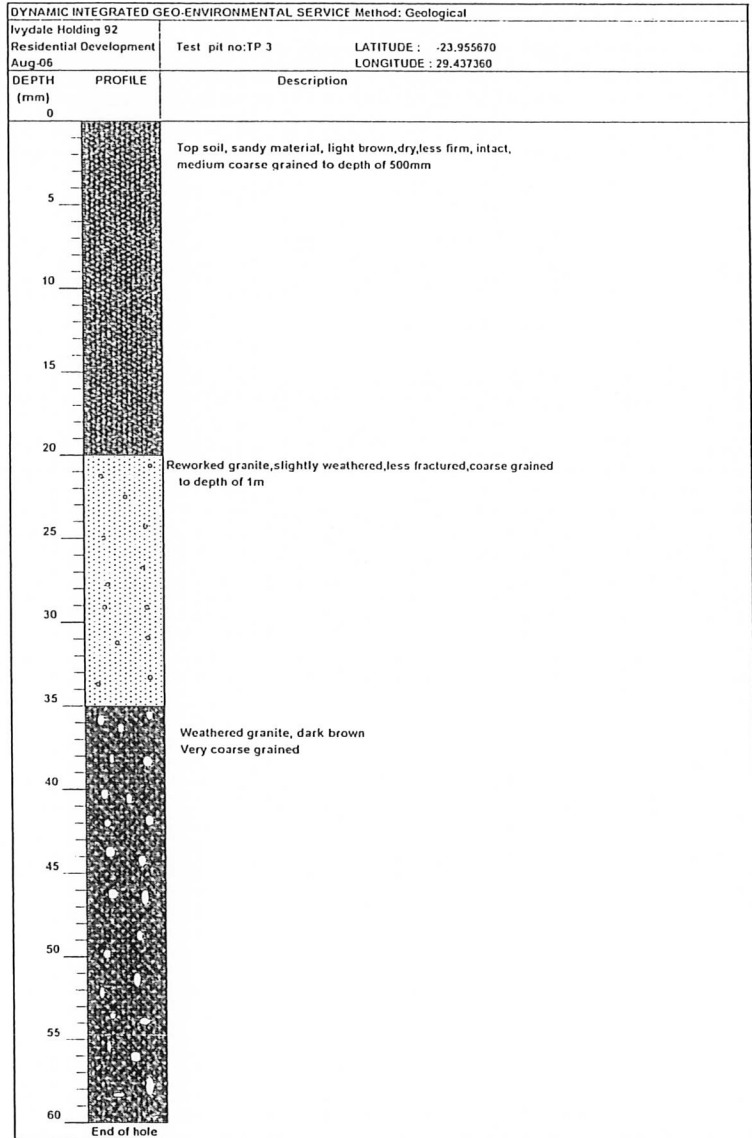
TEST PIT LOGS

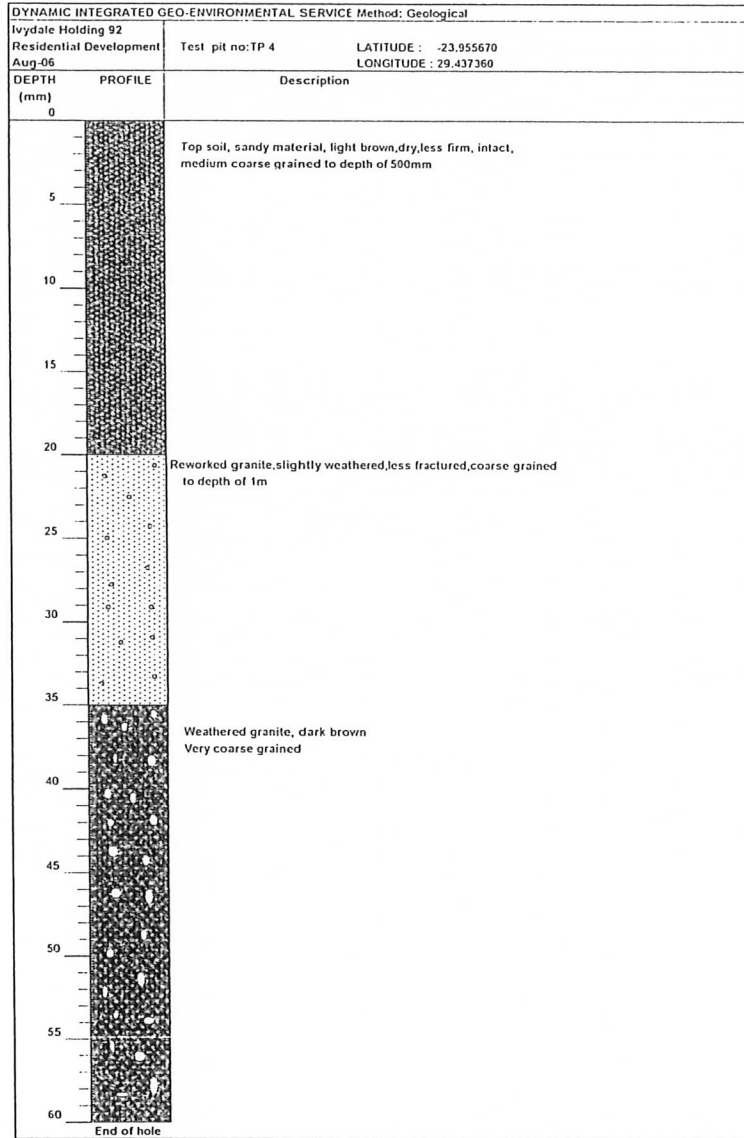
&

TEST PIT LOGS









TEST PIT LOG RECORD

PROJECT SITE: LOGGED BY:	IVYDALE Holding R.V. RAMBUWANI	TEST PIT NO: DATE LOGGED:	TP01 08-Jun-06	LATITUDE: LONGITUDE:	23.87904 29.51626
Depth in mm	Description	Excavatibility			
		Class			
0-500	Top sandy soil light brown in colour, medium coarse grained	Soft			
500-1m	Reworked granite, slightly weathered, creamy white, fractured	Hard			
1m-1.5m	Refusal, solid granite, slightly weathered, less fractured	Very Hard			
NOTES: <p style="text-align: center;">Pit backfilled by excavated materials</p>					
DYNAMIC INTEGRATED GEO-ENVIRONMENTAL SERVICES					

TEST PIT LOG RECORD

PROJECT SITE: LOGGED BY:	IVYDALE Holding R.V. RAMBUWANI	TEST PIT NO: DATE LOGGED:	TP02 August	LATITUDE: LONGITUDE:	23.92541 29.43818
Depth in mm	Description	Excavatibility			
		Class			
0-500	Top sandy soil light brown in colour, medium coarse grained	Soft			
500-1m	Reworked granite, slightly weathered, creamy white, fractured	Hard			
1m-2m	Refusal, solid granite, slightly weathered, less fractured	Very Hard			
NOTES: <p style="text-align: center;">Pit backfilled by excavated materials</p>					
DYNAMIC INTEGRATED GEO-ENVIRONMENTAL SERVICES					

TEST PIT LOG RECORD

PROJECT SITE: LOGGED BY:	IVYDALE Holding R.V. RAMBUWANI	TEST PIT NO: DATE LOGGED:	TP03 August	LATITUDE: LONGITUDE:	23.95567 29.43736
Depth in mm	Description	Excavatibility			
		Class			
0-600	Top sandy soil light brown in colour, medium coarse grained	Soft			
600-1m	Reworked granite, slightly weathered, creamy white, fractured	Hard			
1m-8m	Refusal, solid granite, slightly weathered, less fractured	Very Hard			

NOTES:

Pit backfilled by excavated materials

DYNAMIC INTEGRATED GEO-ENVIRONMENTAL SERVICES

TEST PIT LOG RECORD

PROJECT SITE:	IVYDALE Holding	TEST PIT NO:	TP04	LATITUDE:	23.92522
LOGGED BY:	R.V. RAMBUWANI	DATE LOGGED:	August	LONGITUDE:	29.43722
Depth in mm	Description	Excavatibility			
		Class			
0-600	Top sandy soil light brown in colour, medium coarse grained	Soft			
600-1m	Reworked granite, slightly weathered, creamy white, fractured	Hard			
1m-8m	Refusal, solid granite, slightly weathered, less fractured	Very Hard			
NOTES: <p style="text-align: center;">Pit backfilled by excavated materials</p>					
DYNAMIC INTEGRATED GEO-ENVIRONMENTAL SERVICES					