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REPORT ON SOIL CONDITION

**PROPOSED DEVELOPMENT
CULLINAN**

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**REPORT ON SOIL CONDITIONS
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1. INTRODUCTION AND TERMS OF REFERENCE

At the request of Ms Sandra Pyke of Plan Africa, a geotechnical investigation was carried out, on Portion 1 of the farm Hartebeesfontein 484 - JR.

The purpose of this report is to provide information required for Township establishment, with a view to residential development.

2. SITE DESCRIPTION

The site is situated east of the Sonderwater Prison, about 3km from Cullinan.

The site is in gently undulating terrain, and at the time of the investigation was covered with veld grass and extensive “plantations” of black Wattle and blue gum trees.

Various farm dwellings and sheds are situated on the property, with some previously cultivated areas.

3. GEOLOGY

According to the 1:250 000 scale geological map of the area, the entire site is underlain by Waterberg Sandstone and Quartzite with some Karoo shale in the south east corner, although the latter was not exposed in any of the test pits.

4. FIELD AND LABORATORY WORK

During the week beginning 29th October 2007, 28 test holes were dug to a maximum depth of 2,1m, using a TLB. These holes were then profiled in accordance with the accepted practice, and samples taken for Laboratory analysis.

The detailed test results will be issued as an Addendum to Appendix B, of this Report, when they become available.

5. SUB SOIL CONDITIONS

Drawing 544/001 shows the Site Class applicable at each of the test holes. The legend on the drawing complies with that set out in Table 3 of the generic specification GSFH/2 by the National Department of Housing entitled “Geotechnical site investigations for housing developments”.

In general terms the high lying portion of the site towards the North east, has fairly shallow rock outcrop, with the remainder being covered by relatively deep, fairly loose residual soils, which is essentially underlain by weathered Quartzite or Sandstones.

The majority of the site has been classed as S1, which in terms of Table 5, consists of soils of medium compressibility, and where this horizon is shallow, foundations should be taken to a level below it, onto the dense residual Quartzites.

5.1 Foundations

The general geotechnical conditions within each of the Class areas can broadly be described as follows:

Site Class R- This area occurs in the high-lying north eastern portion of the site, and the typical foundation material consists of a thin soil horizon or rock, which is shallow or outcropping. Apart from the fact that some jack hammer or blasting work may be needed for swimming pools and foundation excavation, no other problems are envisaged.

Where the site class is given as R, foundations should be placed on the residual rock, which is less than 1,3m below existing ground level or on outcrop.

Site Class S - These are silty sands that are moderately compressible, with expected soil movements in the range of 10 to 20mm.

Generally it would be prudent to found any structure beneath these horizons on the competent sandstone if it is within economical reach. In areas where these soils are deeper, they should be removed and replaced, or imported materials used, and placed in compacted layers.

5.2 Roadworks

Within Site Class S1, the soils are generally suitable for road subgrade construction purposes only.

6. FOUNDATION RECOMMENDATIONS

Each zone is discussed below in broad terms, although additional investigations will be necessary for detailed foundation design purposes.

6.1 Site Class R

Foundations of structures and houses in this area should be placed directly on the rock, and where pockets of loose material occur between these outcrops or sub outcrops, they should be removed to obtain a uniform foundation.

6.2 Site Class S1

This zone presents the most difficult founding problems on site because of their fine loose nature.

Where possible structures should generally be founded below these transported soils on the dense residual Sandstone/quartzite. However, if structures are light, and the transported soils are more than 1,3m thick, then provided the material has been assessed for ease of compatibility, it could be removed and replaced beneath the footings in compacted layers, to a depth of 600 to 800mm below the load carrying wall foundations, to give less than 15mm per blow, when tested with a DCP.

If foundation construction takes place in the wet season, it would generally be prudent to import G5 quality soil to use as backfill, or make use of a reinforced raft foundations.

7.0 ROAD CONSTRUCTION RECOMMENDATIONS

Each of the zones is discussed here in broad terms, but it will be necessary to carry out additional laboratory tests during the construction phase to verify that the strength and grading characteristics of the soils are suitable for the particular use.

7.1 Site Class R

Soils in these areas are generally good, and where possible, roads should be placed on fill where they pass over outcrops, or otherwise blasting or some other form of removal of rock outcrops would be necessary.

7.2 Site Class S1

These soils are generally adequate, and can be used for **subgrade** construction.

Subbase would generally need to be imported, as would the **base**; the latter would need stabilising when used under block-paved areas.

A typical pavement structure for asphalt surfaced roads is given below.

- Surface 30mm Asphalt
- Base 125mm G2 to 86% ARD
- Subbase 125mm G5 to 95% Mod AASHTO
- 150mm G6/G7 to 93% Mod AASHTO
- Insitu 150mm G6/G7 to 90% Mod AASHTO.

Where block paving is used the following structure is recommended.

- 60/80mm G-Blocks to SABS 35MPa
- Base 125mm C4 compacted to 95% Mod AASHTO
- 150mm G6/G7 to 93% Mod AASHTO.
- Insitu 150mm G6/G7 to 90% Mod AASHTO.

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APPENDIX A
SOIL PROFILES

APPENDIX B

LABORATORY TEST RESULTS

(To Follow)

**TABLE 2
SUMMARY OF CBR TESTS**

Hole No	Depth (m)	CBR ¹	Mod ³ kg/m ³	OMC ⁴ %	Soil type

- 1 California Bearing ratio @ 95% Mod AASHTO density
- 2 Unconfined Compressive strength @ 100% Mod, in kPa, when stabilized with 3% Walcrete.
- 3 Mod AASHTO density in kg/m³
- 4 Optimum Moisture content as a %

**TABLE 3
SUMMARY OF UCS TESTS**

Hole No	Depth (m)	UCS ¹	Mod ² kg/m ³	OMC ³ %	Soil type

- 1 Unconfined Compressive strength with 3% Walcrete
- 2 Mod AASHTO density in kg/m³
- 3 Optimum Moisture content as a %

APPENDIX C

DCP RESULTS