

# REPORT ON A PHASE 1 GEOTECHNICAL INVESTIGATION OF NGCONCO ROAD, NORTHERN KWAZULU-NATAL.



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# REPORT ON A GEOTECHNICAL INVESTIGATION OF NGCONCO ROAD, UMZINYATHI, NORTHERN KWAZULU-NATAL.

## 1. GENERAL SITE INFORMATION

### 1.1 Introduction

The findings of a preliminary geotechnical investigation on Ngconco Road roughly 2km south-west of Keate's Drift are given in this report. The road is indicated on the *Locality Plan, Figure 1, below.*

The scope of work for the investigation specified amongst others the following investigation procedures:-

- i) Determine the site geology.
- ii) Establish the soil, weathered rock and outcrop types across the site.
- iii) Locate potentially suitable surfacing material.
- iv) Establish the presence of any potential geotechnical hindrances towards further development of the project.



**Figure 1: Locality map, indicating the proposed road.**

This report is based on information obtained from:

- Dundee geological map, sheet 2830 to scale of 1:250 000.
- Rock and soil exposures along the proposed road.
- Aerial photographic data from Google Earth.
- Topographical survey of the site in digital format.



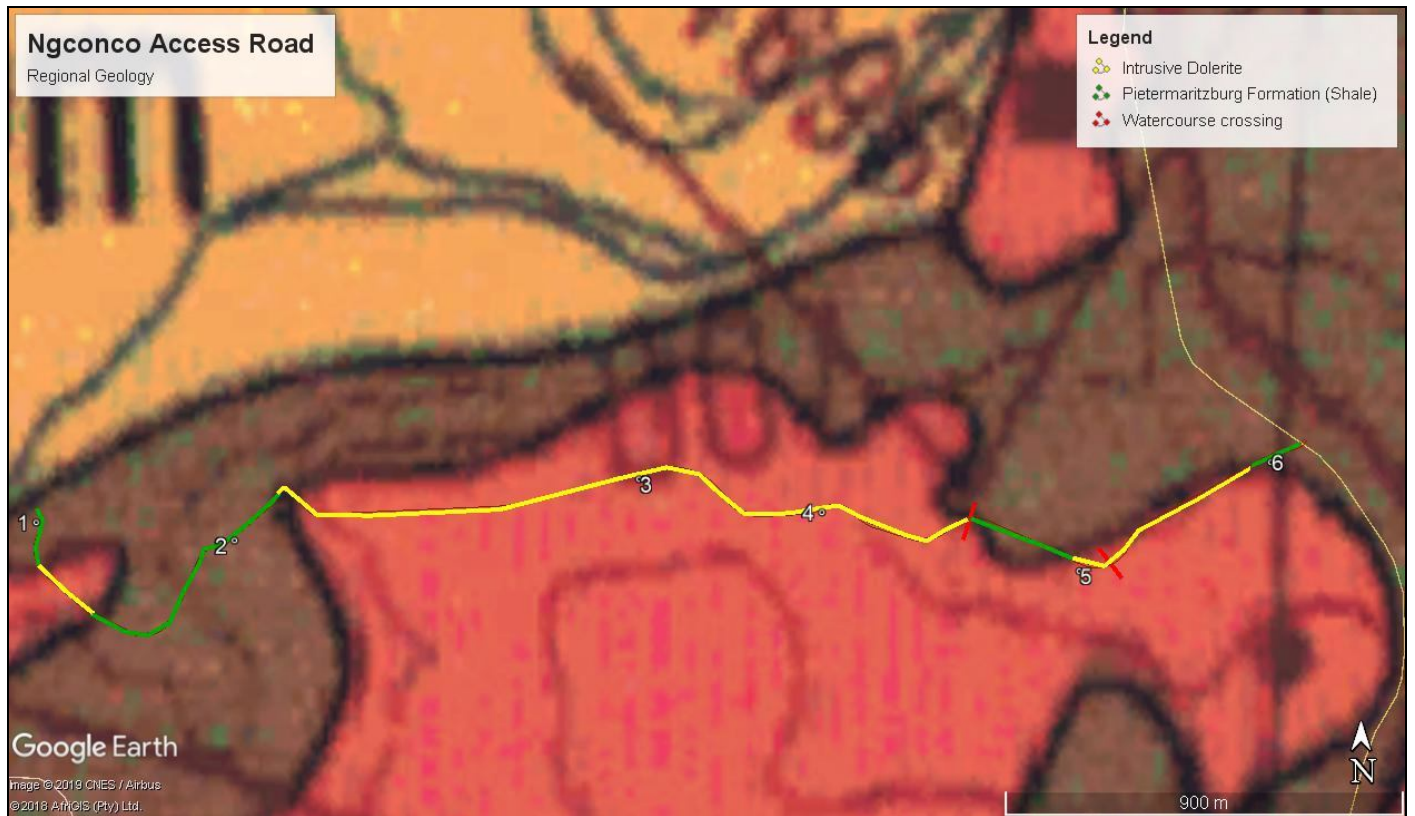
**Figure 2: Site Plan with areas underlain by shale (green) and dolerite (yellow) indicated.**

## 1.2 Topography

The road has a generally moderate gradient becoming steep in places towards the stream crossings and especially just east of POI (Point of Interest) 2 . The route crosses two minor seasonal water-courses.

## 1.3 Geology and Soils

According to the *Geological Sheet, 2830 Dundee*, the proposed road is underlain by Pietermaritzburg Formation shale at short intervals with the bulk of the site being underlain by intrusive dolerite. An extract of the published geological map is shown below in *Figure 3*.



**Figure 3: Extract of the published geological map showing that the study is underlain by Pietermaritzburg Formation (brown) and Intrusive Dolerite (red).**

### 1.3.1 Pietermaritzburg Formation Shale

The sections underlain by the Pietermaritzburg Formation along the route are characterised by mostly shallow soils (<0.2m) while outcrop of the highly fractured soft-rock shale is often visible. It is expected that the fractured shale bedrock can be excavated to depths of at least 0,5m below current surface level with relative ease by means of 20T tracked excavator or similar.

No deep cuts into the bedrock are foreseen, however should any cuts be required in the shale bedrock, then these should remain stable without much further improvement since the bedrock is horizontally bedded. The weathered shale bedrock is considered to be excellent founding/sub-grade material especially for the proposed use.

No problem soils are anticipated for this section. Scattered small (<0,5m diam.) surface boulders (dolerite) cover the shale in places.



**Figure 4&5: Existing road surface, typical of the areas underlain by shale along the proposed route.**

#### *1.4.2 Intrusive Dolerite*

The largest part of the proposed new road is underlain by dolerite. These sections are characterised by abundant surface dolerite boulders (mostly <0.5m diam.), underlain by a thin layer of clayey colluvial/residual material, which in turn is underlain by mostly highly weathered sugary-textured dolerite with abundant corestones (small boulders).

The material is by and large easily excavatable, but extreme caution will be needed to prevent the loose, round boulders to roll down the steep slopes during construction. It may be difficult to create an even road surface due to the abundance of boulders of various sizes.

Colluvial material originating from dolerite often forms expansive clay, very little evidence of this type of material was however noted during the drive-over survey.



**Figure 6&7: Typical conditions of sections underlain by dolerite along the proposed route.**

## **2. GEOTECHNICAL ASPECTS**

### **2.1 Workability of Site Materials**

#### *2.1.1 Excavation Characteristics*

TLB mechanical excavation operations will be adequate to excavate through the colluvium and residuum (top layers) Tracked excavators (20T) will be required to excavate the weathered bedrock (shale and dolerite) as well as the abundant boulders (dolerite).

#### *2.1.2 Compactability of Site Materials*

Most of the underlying weathered rock (below 0,2m for the most part) will likely conform to G7-G8 type material. Imported surfacing material was noted on the only on short sections towards the east.

#### *2.1.3 Stability of Excavations*

The stability of excavations/cuts along the proposed route will be assessed in the test pits during the geotechnical investigation.

#### 2.1.4 *Problem soils*

Soil cover is generally thin to non-existent hence minimal problem soils are anticipated. As mentioned, transported soils originating from dolerite often form heaving clays; however, little evidence of active clayey soils was noted.

#### 2.1.5 *Seepage*

Good surface drainage measures should be in place. No evidence of shallow groundwater was noted during the investigation, mostly due to the topographical setting. Two seasonal water source crossings (see *Figure 2*) were noted. Relatively shallow founding of culverts on weathered bedrock is anticipated.

#### 2.1.6 *Borrow Material*

There is an existing borrow-pit roughly 1,0km south of the start of the road at (28°53'2.80"S 30°29'20.60"E). Shale gravel material has been used extensively from this borrow pit but there is still ample room for extension. The material from this borrow pit has been used to surface the gravel road accessing the area and seems to be performing satisfactorily, with minimal dirt in summer but slightly dusty in winter.



**Figure 8: Existing borrow pit in close proximity to the proposed new road.**

### 3 CONCLUSIONS AND RECOMMENDATIONS

The site is stable for development provided that the recommendations given in this report and a future penetrative geotechnical investigation are implemented.

Significant factors pertaining to the final design are as follows:

- Generally moderate slopes with only isolated short sections with steep inclines are anticipated.
- Imported surfacing material was noted only on short isolated sections.
- No significant problem soils were observed.
- No Groundwater is anticipated to be encountered along the road during construction.
- Generally good and even founding material/subgrade is anticipated at nominal depth along sections underlain by shale; while abundant boulders and uneven surfaces are foreseen for the sections underlain by dolerite.
- An existing borrow pit where shale material has been extensively extracted was located within 1km of the proposed road.

Every effort was made during the site investigation to ensure that generally accepted practices of our profession were used in the sub-surface evaluation of the site, and that the sampling and testing was representative of the soil/rock conditions observed on-site. However it is impossible under the constraints of a restricted investigation of this nature to guarantee that zones of poorer geological materials were not identified that could have a significant bearing on the outcomes of this investigation. The investigation has therefore attempted, through interpolation and extrapolation at known test locations, to identify problem issues of a geotechnical nature on which this report is based. Variances in soil and rock quality and quantity from those predicted may be encountered during construction and these should be recorded, however no warranty against these variations is expressed or implied, due to the geological changes that can occur over time due to natural processes, or human activity.



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