

Kuruman : Wrenchville : Kalara Investments

Geotechnical Investigation

1 Background :

Noordkaap Geokon, as a Geotechnical and Geological Consulting firm in Kimberley, was appointed by mr. Thandu Ntintilli of Kuruman to do a geotechnical investigation on the site of a proposed housing development at Wrenchville, near Kuruman in the North West Province.

2 Location of Site :

The site is located in the township of Wrenchville, some 12 km north east from Kuruman on the road to Mothibistat, in the Northwest Province, at the following coordinates : S 27.444430 E 23.458551

3 Geology and Site Description:

The Study Area, as indicated by the client, is located between the present cemetery on the east and the tar road to the west. (Refer to enclosed map) A drainage valley which strikes roughly east to west, forms the southern border of the site.

The higher ground east of this course, consists of a gravel covered, dolomite outcrop of the Ghaap dolomite formation which is pitted by solution cavities and also filled with banded ironstone gravel derived from the nearby mountain range to the west of the town.

The northern border of the site is formed by the tar road to the cemetery.

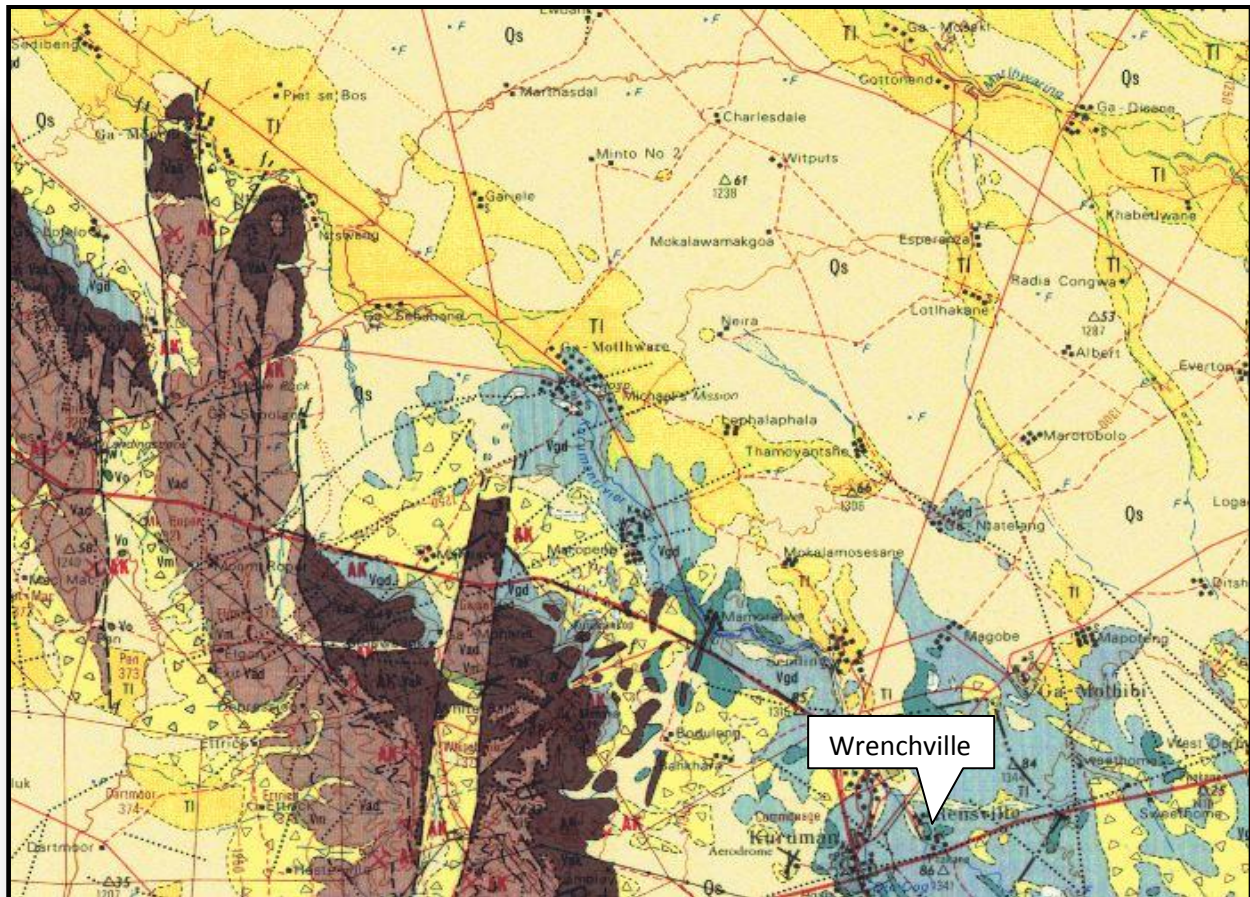
Along the southern border, a main sewer line runs from east to west. It is partly covered by imported gravel material.

Although the surface is marked with sporadic outcrops of solid dolomite, it cannot be guaranteed that the underground is stable and without solution cavities.

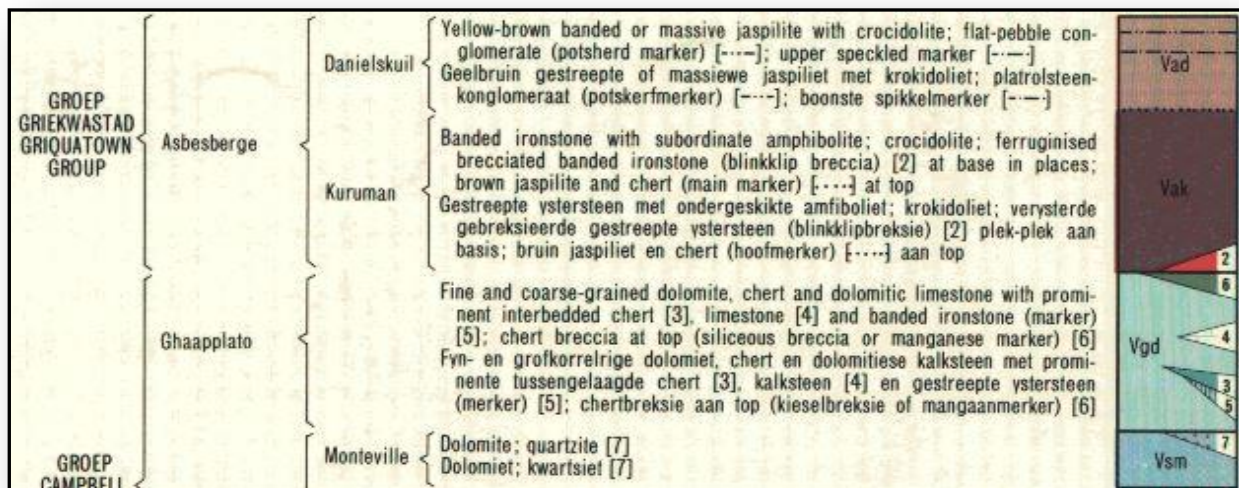
Therefore, a separate dolomite investigation must be conducted and a report submitted to the Council for Geoscience, after taking into consideration all data that was accumulated on the site, namely gravimetric survey, geo – electric survey and drilling.

A clip from the 1 : 250 000 geological map, sheet 2722 Kuruman, below, shows the extent of the dolomite formation.

The dolomite is often covered by surficial deposits of sand and gravel, which is indicated as light yellow on the geological map.



Geology of the area around Wrenchville



Geological Legend (Info ex sheet 2723, 1:250 000 Geological map, Council for Geoscience)

4 Method of Investigation :

The site was investigated by digging 8 test holes on the site by means of manual labor.

The test holes were profiled and sampled, and the material tested in the laboratory of Roadlab/Prehab JV in Kimberley according to the TMH1 document of standard test procedures.

Eight Dynamic Cone Penetrometer soundings were also taken to determine the in situ safe bearing capacity of the soil, as well as the depth of the rock horizon underneath the sand.

The in situ bearing capacity could not be accurately determined in the gravel material due to the coarseness of the gravel.

5 Results of the Investigation :

5.1 Test holes :

The complete test results are shown on the enclosed field data sheets.

- Tn 1 0 – 1000 mm : Dry, sandy red gravel
> 1000 mm : Sandy, red, gravel
- Tn 2 0 – 400 mm : Grey, loamy soil
400 – 700 mm : Grey, sandy gravel
700 – 1000 mm : Yellow, dry, loamy sand and gravel
- Tn 3 0 – 200 mm : Light red, sandy gravel
200 – 1000 mm : Red, dry gravel
- Tn 4 0 – 400 mm : Dry, red, sandy gravel
400 – 800 mm : Sandy gravel and calcrete blocks
>1000 mm : Dry, soft calcrete
- Tn 5 0 – 600 mm : Dry red, sandy gravel
> 600 mm : Dry, red, sandy gravel with large calcrete blocks
- Tn 6 0 – 600 mm : Dry, red, sandy gravel.
>600 mm : Dry, red, sandy gravel with large calcrete blocks
- Tn 7 0 – 1000 mm : Dark red, sandy gravel
- Tn 8 0 - 500 mm : Dry, red gravel with loose, to hard, m calcrete blocks
> 500 mm : Hard calcrete.

5.2 Soil properties :

A Horizon :

The A horizon is on average 600 mm thick and consists mainly of dry, red, windblown sand with no Plasticity Index and a grading modulus of 0.93 to 1.7.

The CBR shows a value of 43 at 95 % compaction.

B Horizon :

The B horizon, deeper than 700 mm, consists of sandy gravel with no PI and an average grading modulus of 1,4.

The CBR on this material is 71 at 95 % MAASHTO compaction.

5.3 In Situ Bearing Capacity :

The determination of bearing capacity of the coarse banded ironstone gravel by means of a DCP is not very accurate because of the coarseness of the material. Although the determined DCP values show good bearing capacity, it cannot be guaranteed and should only be used as an indication.

A total of eight (8) DCP soundings were taken to determine the in situ bearing capacity of the soil.

These values showed that the gravel on average displays a good bearing capacity of more than 100 kPa which is needed for standard building foundations..

The bearing capacities of the B –horizon are even better than that of the A horizon.

5.5 Consolidation potential :

Although no consolidation tests were done, the impression on site was that consolidation may not be possible due to the bridging and interlocking effect of the aggregate.

5.6 Seismic Events :

Kuruman is not known for strong seismic events.

5.7 Ground Water :

No water table was found on site.

Since the site is underlain by a dolomite formation, any water absorbed by the topsoil, would drain into the cavities and solution hollows of the dolomite.

5.8 Active Clay :

No active clay was found on site.

a. Dolomite Investigation :

A dolomite investigation of Wrenchville was done during June 2011 by Holland- Muter and Associates cc (Report LM 901/11) for ASSMANG Ltd. on a site about 2 km south of this site.

The results of this investigation showed that gravity contours less than -0.35 mGals indicated higher risk areas.

The gravity survey done by EEGS on the school site just to the north, showed virtually the entire site with contours less than 0.3 mGals to as low as -0.6 mGals over the area which we classified as a filled doline.

This means that the probability of a sink hole or doline to form is fairly high.

A full scale dolomite investigation must still be executed and approved by the Council for Geoscience in order to register this project at the NHBRC.

6 Conclusions :

6.1 The A and B horizons displays good bearing capacities, fit for the use of standard strip footings.

7 Recommendations :

7.1 To prevent any settlement that may take place under footings, it is recommended that the foundation trenches are to be flooded with water after excavation, and then compacted with three passes of a "Whacker" or similar machine

7.2 We estimate about 10 % hard rock excavation on the entire site. The remainder would be soft excavation that can be done manually.

7.3 Bedding material for pipes and fill under floors, can be screened from the excavated gravel, or can be imported.

7.4 Gravel for road construction and structural fill can be sourced from the site. It is advised that a vibrating tamping roller be used for compaction.

7.5 We definitely advise the investigation of the dolomites.

We trust that you find this in order, and thank you for your valued support.



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NOORDKAAP GEOKON