A GEOPHYSICAL INVESTIGATION AND GEOLOGICAL INTERPRETATION OF PART OF THE DIAMONDIFEROUS GRAVELS ON THE FARM GRASFONTEIN (356 JP), WEST OF BAKERVILLE

by

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ABSTRACT

The results of a gravity and magnetic study comprising 2911 and 14 650 stations respectively over a small portion of the diamondiferous gravels north of Lichtenburg and immediately west of Bakerville, are described.

The magnetic survey precisely located the Grasfontein dyke which crosses the area.

Two major trends of gravity lows averaging -0,6 mgal are recognised; (i) a main WSW-ENE trend and (ii) a less prominent nearly N-S trend. Geological observations and drilling indicate that the more pronounced WSW-ENE gravity anomaly trend is associated with the major direction of diamond-bearing gravel runs, whilst the N-S trend is more often associated with leached zones in the dolomite, which may be covered with shallow gravels only. These surface geological trends are shown to have developed from a similarly orientated joint pattern in the underlying dolomite of the Chuniespoort Group by differential weathering and erosion. The preferential development of the WSW-ENE joints is reflected in the orientation of the palaeo-drainage pattern and was thought to have some influence on it.

The success of the gravity survey in locating subsurface karst topography and gravels can be mainly attributed to the significant density contrast between the dolomite and chert on the one hand and the wad and residual chert in the leached zones and superficial deposits on the other.

Sampling results indicate that the diamonds, following their separation from the primary source may reflect a polycyclic sedimentological history in which the Dwyka tillite is thought to have

been of great importance. The primary source of the diamonds is thought to lie a considerable distance from the Lichtenburg-Ventersdorp region in a north-easterly direction.

SAMEVATTING

Die resultate van gravitasie en magnetiese opnames van 2911 en 14 650 stasies onderskeidelik oor 'n klein gedeelte van die diamanthoudende gruise noord van Lichtenburg, en wes van Bakerville, word beskryf.

Twee hoof rigtings van gravitasie minima, gemiddeld 0,6 mgal elk, is waargeneem; (i) 'n hoof WSW-ONO rigting, en (ii) 'n minder prominente amper N-S rigting.

Geologiese waarnemings en boorwerk toon dat die prominente WSW-ONO gravitasieneiging geassosiëer word met die hoofrigting van voorkoms van die diamanthoudende gruisafsettings, terwyl die N-S neiging meesal geassosiëer word met geloogde sones in die dolomiet. Hierdie sones mag bedek wees met vlak gruisafsettings. Hierdie oppervlakkige geologiese kenmerke het skynbaar ontwikkel vanuit 'n ooreenstemmende patroon van nate in die onderliggende dolomiet van die Groep Chuniespoort waar differensiele verwesing en erosie plaasgevind het.

Die voorkeurontwikkeling van die WSW-ONO tensiebreuke word gereflekteer in die orientasie van die paleo-dreineringspatroon en het vermoedelik 'n invloed daarop gehad.

Die sukses van die gravitasie-ondersoek in die opspoor van ondergrondse karsttopografie en gruise kan grootliks toegeskryf word aan die beduidende digtheidsverskil tussen die dolomiet en chert aan die een kant en die mangaanaarde en verweerde chert in die geloogde sones, en oppervlakkige afsettings aan die ander kant.

Toetse op grondmonsters van die gruise dui aan dat die geskiedenis van diamante, na hulle skeiding van die primêre bron, gekompliseerd is deur die rol wat die Dwyka tilliet gespeel het, 'n polisikliese sedi-

mentologiese geskiedenis reflekteer waarin die Dwyka tilliet 'n belangrike rol gespeel het. Die primêre bron van die diamante is vermoedelik in 'n noordoostelike riging ver van die Lichtenburg-Ventersdorp gebied.