THE GEOLOGY OF THE AREA AROUND VANRHYNSDORP CAPE PROVINCE

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BIBLIOGRAPHY

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SUMMARY

The present report deals with a Geological Survey undertaken in the Vanrhynsdorp area during the period 78-04-I9 to 78-04-28.
The area covered by the survey was within a I0 kilometre radius of the town of Vanrhynsdorp and represents a surface area of 78,5 square kilometres. Geological mapping was carried out on aerial photographs with a scale of I: 50,000 (Job no. 764) and the data transferred to I: 50,000 topographical maps, 3II8 DA Vanrhynsdorp and 3II8 DB Urionskraal.
The Geological mapping was intended to supplement a borehole survey carried out in the area as part of an investigation into the water supply situation at Vanrhynsdorp.
Previous mapping was carried out by D.K. Toerien in I954-55 when this and other areas to the west and south were investigated.
The town of Vanrhynsdorp lies at an altitude of I04 metres above mean sea level and lies on the main road link to the north and south.
The average rainfall recorded for Vanrhynsdorp is I37,2 mm.
The area is mainly concerned with wheat and lucerne cultivation along the Troe-Troe River and sheep farming elsewhere.

I. PHYSIOGRAPHY

Most of the area is occupied by rolling sand covered hills which attain a height of I77 metres north of Vanrhynsdorp, decreasing to II0 metres to the south west.
To the south the land rises steeply to the Matzikammaberge which is capped by Table Mountain Sandstone and attains an elevation of I0I5 metres. This is the dominant topographical feature in the area and breaks the monotony of the surrounding low lying peneplain.
The main drainage in the area is effected by the Troe-Troe River which has incised itself into the peneplain. However, this river only flows for a few months each year. Other rivers are the Droë River to the north and the Wiedou River at the southern boundary of the area. These are both tributaries of the Troe-Troe.

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II GEOLOGICAL FORMATIONS

The bedrock formations represented in the area are pellitic and calcareous rocks of the Nama Group and sandstones and shales of the Table Mountain Group.
The Nama rocks are largely concealed beneath surface deposits of varying thickness which are of Tertiary to Recent age.
Exposures of the solid rock formations are mainly restricted to drainage channels and some hills of more resistant strata around Vanrhynsdorp.
The classification adopted by Toerien was originally formulated by H. Jansen in the area immediately to the north and is as follows:

Tertiary to Recent deposits		Aeolian sands Surface limestone Surface ironstone Silcrete
Cape System Table Mountain Series		Lower sandstone
Malmesbury Formation	Quartzite stage.	Quartzite with interbedded phyllite, feldspathic quartzite, arkose, greywacke and grit.
	Phyllite stage.	Phyllite with interbedded quartzite, feldspathic quartzite, arkose, greywacke and grit.
	Calcareous stage.	Limestone, dolomite, marble and interbedded phyllite and shale. Black carbonaceous shale and phyllite, lower dolomite

In the area covered by the present survey only rocks of the upper part of the calcareous stage and the phyllite stage are represented.
The classification applicable to the present survey area is therefore as follows:

Tertiary to Recent deposits		Alluvium Aeolian sands Reddish brown sandy soil Calcrete Ferricrete Silcrete
Cape Supergroup	Table Mountain Group	Sandstone with interbedded shale.
Nama Group		Phyllite and shale, locally shistose with interbedded sandstone bands and ironstone lenses Limestone, dolomite, dolomitic limestone with chert bands and marble.

II-I NAMA GROUP

In general the strata have a northerly to north easterly strike, with dips of I4 - 80°. The shales and phyllites frequently show a high degree of deformation and have a crumpled appearance with well developed cleavage and phyllitic lineation. The bedding planes in the calcareous rocks are often destroyed by recrystallisation and the development of flow lines.
In addition to the large scale regional folding developed in the area, small scale folding is everywhere apparent, and often intense. For example, on the road from Vanrhynsdorp to Gifberg where it runs parallel with the National road, a series of small north north east trending en echelon folds can be observed in the road cutting.

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Quartz veins, varying from less than a millimetre to a metre in width, are widespread in the phyllitic rocks. The larger veins commonly have a strike parallel to that of the strata and are vertical or nearly so. They can generally only be traced for a maximum of IO - 20 metres.

II-I.I Calcareous Lithologies

The main and most continuous outcrops are found in the south west part of the area along the Troe-Troe and Wiedou rivers. Outcrops can be traced northwards to Vanrhynsdorp with the most northerly outcrop being on the Droë river, 4 kilometres north west of the town. Further outcrops can be found to the east on the slopes of Matzikammaberge.

The rocks are typically massive and grey to dark blueish grey in colour and include limestone, dolomite, dolomitic limestone and marble. Dark grey cherty bands are found in the outcrops along the Troe-Troe river near Aties homestead. Quartzitic types are found to the west of Vanrhynsdorp along the road to Vredendal.

The rocks in the latter outcrops also exhibit a peculiar weathering characteristic not seen elsewhere in the area. Here they weather to a brownish yellow colour with a sandy appearance.

Outcrops of marble are restricted to the southern part of the area where they can be seen in the road cutting where the National Road crosses the Wiedou River and at the marble quarries further east. This marble is light grey and crystalline with dark grey flow lines and bands.

The relationship of the isolated outcrops of calcareous rocks around Vanrhynsdorp to the main outcrops in the south east is not clear. They may be part of the same horizon occuring as inliers or as lenses within the surrounding shales and phyllites.

The economic aspects of these calcareous rocks are discussed in a later chapter.

II-I.2 Pellitic Lithologies

The main outcrops of these rocks form a north west trending zone extending from the Matzikammaberge to just west of Vanrhynsdorp, with resistant hills such as Mauwerskop (343metres)

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rising above the surrounding peneplain.
The main rock types are shale and phyllite with locally developed shistose horizons in the south east and interbedded sandstone bands ranging from quartzite to greywacke and grits. Ironstone lenses are locally developed.
The shales are yellow, reddish or greyish pink in colour and poorly exposed. Typical exposures can be seen to the south east of Vanrhynsdorp (See plate I)
The phyllitic rocks are greenish to greenish grey in colour and are more resistant to weathering, forming the more upstanding topography such as Mauwerskop and hills to the west of Vanrhynsdorp.
A factor contributing to this resistance is the occurence of interbedded sandstone horizons as mentioned above. These bands are usually less than 0,5 metres in thickness.
Where the shales and phyllites are deeply weathered a typical surface covering of brownish clay with abundant quartz fragments is developed.
The shistose types, developed along the Troe-Troe River approximately 6 - 7 kilometres from Vanrhynsdorp, are quartz mica shists with pyrite.

II-2 TABLE MOUNTAIN GROUP

Rocks of the Table Mountain Group form the capping of the Matzikammaberg in the south east of the area. They rest with a marked unconformity on the underlying Nama sediments and the lowermost sandstone/conglomerate band forms the lowest ridge on the mountain, visible in plate I. This sandstone band thickens to the west.
This is followed by a fairly thick shale band which is in turn succeeded by a massive, well jointed pink to reddish sandstone.
The slopes of Matzikamma are covered with sand to boulder size talus derived from these rocks.

II-3 TERTIARY TO RECENT DEPOSITS

Superficial deposits cover most of the area under investigation and consist of dune sand, reddish-brown sandy soil, calcrete, silcrete and ferricrete. The first two are the thickest and most extensive of these deposits.

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II-3.I Dune Sand

A north east-south west trending belt of dune sand occupies the area to the north and north west of Vanrhynsdorp. These dunes are largely overgrown by shrubs and grasses; bare dunes are not seen.
The boundary between the sandy soil and the dune sands is not very marked in the field but stands out very clearly on the aerial photographs where north east-south west trending crests can be discerned.
The dune sand is reddish brown in colour and has largely been derived from weathered Table Mountain Sandstone. Accumulations of sand can be seen around weathered outcrops of Table Mountain Sandstone further south near Klawer and elsewhere.

II-3.2 Silcrete

Patches of silcrete occur fairly commonly to the south of Vanrhynsdorp. These deposits are almost entirely confined to the vicinity of drainage channels and seldom exceed 10 square metres in area. The outcrops have a rounded hummocky appearance with a shiny surface usually coated with a characteristic red lichen.
The colour ranges from buff to dark brown depending on iron content and fragments of quartz up to pebble size occur in a micro-crystalline matrix.
These deposits are found associated with both pellitic and calcareous rocks.

II-3.3 Ferricrete

Less common and smaller in extent than the silcrete deposits are patches of dark brown to brownish black ferricrete. These deposits also tend to occur along drainage channels and may be associated either with pellitic or calcareous rocks although appear more commonly on weathered shale outcrops.

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II-3.4 Calcrete and Reddish - Brown Sandy Soil

Calcrete is not extensively developed in the area and deposits of appreciable extent are not found. Instead it tends to occur as nodules and thin crusts within the reddish brown sandy soil which covers most of the area. Patches of calcrete can be seen along the National Road to the north and south of Vanrhynsdorp where it occurs as an off - white, structureless surface covering.
The thickness of the sandy soil varies. Where it grades into alluvium along the Troe-Troe River at Vanrhynsdorp exceptional thicknesses have been reported from boreholes.
One borehole just to the east of Vanrhynsdorp and 50 metres from the river bed reportedly penetrated 72 metres of sand.

III ECONOMIC GEOLOGY

The calcareous rocks in the area are utilised on a small scale for quarrying operations.
The marble occuring in the south of the area is mined at a small quarry, as shown on the accompanying map. Some of this marble is exported to Italy.
A small outcrop of quartzitic limestone to the west of Vanrhynsdorp is used as a source of road metal by the Divisional Council on account of its' hardness.
Gypsum occurs fairly extensively in the area both in the surface deposits of sandy soil and in the shales and weathered portions of the calcareous rocks. Mining operations are at present restricted to the quarries to the north of Vanrhynsdorp where the gypsum occurs in the sandy surface deposits.
As mentioned previously the rainfall around Vanrhynsdorp is low and the rivers only flow sporadically each year. The area is therefore dependant on ground water for its water supply. This is mainly for domestic use, stock watering and irrigation of lucerne.
The towns' main water supply is obtained from two boreholes located to the north of the town but there are also over 200 private boreholes within the municipal area.

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Water qualities vary greatly from 256 mg/l for a borehole just to the east of the town to over 8000 mg/l. The best quality water is obtained from boreholes sunk along the course of the Troe-Troe River, to the east of Vanrhynsdorp.

Plate 1. Panoramic view of survey area, looking South East. Vanrhynsdorp in centre with trees marking the course of the Troe-Troe river. Matsikamma mountain in centre background.