STUDY METHODS APPLIED IN THE INVESTIGATION OF KALAHARI GROUP SEDIMENTS

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The selction of an area of interest in Botswana is followed by a study of Landsat TM images of that particular area. Certain features on the images are highlighted for investigation in the field. The study area is then traversed and outcrops and borrow-pits are logged in detail. Boreholes in the area are logged by means of chips or cores and a geophysical borehole logger. Since most of the work in the Kalahari is done above the water table, Natural gamma and density are the most useful geophysical logs. The geophysical logs are useful in defining contacts and small upward fining and coarsening sequences in the Kalahari Group, which are often difficult to recognize with chip-logging. The upward fining and coarsening sequences are in turn useful in the interpretation of the depositional environment for the sediments.

A geological map of the area is then compiled, digitized and entered into a GIS (Geographic Information System). The GIS is used to compare and overlay different sets of data in order to better understand the data. For example, the geological map can be superimposed on the Landsat TM images or topographic maps and even moulded to the topography for a 3-D view. Prospecting results are also superimposed on the geology to aid in the understanding of those resuts.

Considerable attention is given to Kalahari Group sediments as an understanding of their depositional environments is imperative in order to prospect for deposits hidden under the Kalahari Group.

EVOLUTION OF THE EAST HERERO HYDROGEOLOGICAL REGIME

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Many of the hydrogeological, topographical and Kalahari Group phenomena that are evident today are inconsistent with the current hydrological and hydrogeological regime.

Some of these phenomena include:

- the size and courses of the omurambas;

- the apparent contradiction in groundwater age, chemical quality and distribution;

- the formation of thicknesses of calcretes in the Middle Kalahari formations;

- the incision of the omurambas through these calcretes and in some cases into bedrock.

These phenomena are explained in terms of the evolution of the groundwater regime. It is apparent that the area has been subject to significant climatological and environmental change over the last 40,000 years (Figure 1) after the Upper Kalahari Quarternary dunes were emplaced. Heavy rainfall periods saturated the Kalahari formations to within metres of the surface probably more than once during this period. Further evidence for near surface saturation are stalacmites and stalactites in caves in the Tsodilo Hills in Botswana.

Due to the extreme wavelength of the upper dune system, unconfined aquifer water levels in these sands would mimic topography. Groundwater flow directions were then controlled by the dune and regional topography. Internal drainage after rapid infiltration of rainfall was toward local base levels defined by interdune corridors which carried and controlled surface flow (Figure 2).