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***How Applied Sedimentology was used to Optimise the Economic Life of
Marginal Witwatersrand Gold Mines***

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One of the greatest challenges which the Witwatersrand gold mining industry faced after a century of production was the economic viability of mining low grade and discretely mineralized palaeo-placer deposits at increasing depths of extraction. This applies equally today as it did three decades ago.

The need for stricter geological guidance in its underground mining practices led Rand Mines Ltd., during the 1980s, to introduce **applied sedimentology** to strategic mine planning within its Witwatersrand gold mining operations and to its regional exploration.

Basin tectonic and stratigraphic analyses of the Central Rand Group were instrumental in defining syndepositional structures as having played an important role in controlling the distribution of alluvial facies and gold concentration trend patterns within the principal, auriferous, palaeo-placer 'reefs' of the Central Rand, East Rand and Orange Free State Goldfields. The results of this work were used to predict likely extensions of 'payshoots' into unmined areas.

Another outcome of these interpretive studies was the implementation of an ambitious data capturing program involving the analyses of historical mine sampling information. At the time, this was the largest exercise of its type ever undertaken by the gold mining industry for the purposes of routine mine production planning and within-mine prospecting.

The data bases were used to compile comprehensive sedimentary facies models of the various 'reefs' which had been mined on Rand Mines' gold mines. These models, in turn, determined the practical application of enhanced statistics and geostatistics in ore reserve evaluation. They also resulted in the formulation of a facies classification scheme for all Witwatersrand 'reefs' and provided the base information for later discoveries of certain ore body extensions.

This paper summarizes the basin-wide analysis of 'payshoot' trends from one 'reef' to another in the northern and southern rims of the Witwatersrand Basin. Also presented are the results of applied sedimentology - specific to the Main Reef Leader of the Central Rand Goldfield.

