

A REINTERPRETATION OF THE LICHTENBURG DIAMOND DEPOSITS

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Diamonds in the sedimentary deposits north of Lichtenburg were discovered in 1926. Since then close to 8 million carats of diamonds have been produced, predominantly during the early stages of the digging operations. Diamonds are preserved in sediments that have slumped in a karst topography of almost horizontally bedded Transvaal dolomites. They have been subdivided into a lower and an upper unit of uncertain age. The lower unit is generally chaotic, poorly sorted, and clay rich. The upper unit contains some degree of sorting, is graded and has been interpreted as a fluvial succession. Geomorphic studies suggest that the lower unit may be of Late? Cretaceous age while the upper unit could be Middle to Late Tertiary in age. These deposits have long been interpreted as remnants of fluvial systems that transported the diamonds from an outside source area, probably somewhere to the north. The Swartruggens kimberlites, some 70km to the northeast, have been quoted as a possible source.

However, the poor quality of the diamonds, local variations of diamond characteristics and the chaotic nature of the lower unit are difficult to explain as being the result of a river with a distal source. Detailed studies of the lower unit seem to indicate that kimberlitic minerals increase in abundance with depth, especially in the major potholes. These minerals were also recovered from highly altered igneous material attached to a vertical dolomite wall in one of the major 'potholes'. Analyses of these minerals by electron microprobe suggest that the major mineral chemistry are different to those associated with the nearest known diamondiferous kimberlites both to the north and south. The morphology and dimensions of some of the main 'potholes', which were the principle sources of diamonds, strongly resemble 'pinch and swell' features so typical of fissure or dyke systems. Many of these types of 'potholes' or yamas occur isolated from the main diamondiferous runs and there is no continuity or fluvial connection between these. Generally, these 'potholes' are surrounded by a thin sheet-like deposit of diamondiferous rubble of residual chert and occasional quartzite pebbles set in a ferruginised sandy matrix.

Detailed geophysical surveys indicate that the main east-west orientated 'channel' or 'run' is structurally controlled and associated with some major sinkholes and gravity anomalies. Sediments of the upper unit dominate these runs.

The present geological interpretation is that the lower units are associated and underlain by a system of kimberlite dykes with isolated blows. These were intruded into an already karstified terrain. Karstification has been active since pre-Cambrian times, and this has had an adverse affect on the local stratigraphy and the preservation of the postulated kimberlites. Hence it is not clear whether these intrusions preceded or post-dated Karoo sedimentation. The presence of unabraded agates of possible Karoo heritage favours a Jurassic/Cretaceous intrusion age. Finally, a major unconformity is present between the lower and upper gravels; the latter being part of a local Late Tertiary drainage system that has reworked some of the lower units into locally very rich deposits.