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Characterization and Fracture Potential of the Viola Limestone, I-35 Road Cut, Carter County, Oklahoma

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The Viola Limestone is a rich oil producer in Oklahoma. Production is enhanced in fractured intervals, which tend to be cherty. An outcrop characterization study was conducted along the 730 foot thick I-35 road cut in Carter County, Oklahoma to document the relations among lithology and fracture potential, and to develop simple criteria for identifying fracture-rich zones from conventional gamma-ray logs.

The section was described and representative samples were collected for compositional analysis. An outcrop gamma ray log was obtained by measuring natural gamma radiation with a hand-held scintillometer at 2 ft. intervals throughout the stratigraphic section. Ten intervals--- ranging from carbonate mudstone to grainstone with variable amounts of bedded and nodular chert--- were defined on the basis of lithology. Chert content of the 10 intervals is variable, ranging from 0 % to 21% of total interval thickness. Two of the intervals also contain karst horizons. Fracture frequency was measured on selected beds, and ranges from 0.2 fractures/inch in limestone beds to 3.8 fractures/inch in chert beds.

The 10 intervals are distinguishable by their outcrop gamma-ray log response, so that chert- and fracture-rich intervals can be distinguished from chert- and fracture-poor intervals. A subsurface gamma-ray log through the Viola Limestone in a nearby well revealed a similar pattern of relative variations in gamma-ray response. This calibration of outcrop gamma ray log to subsurface gamma ray log provides a means of predicting chert- and fracture-rich intervals in subsurface wells using a gamma-ray log. These results can improve the ability to recognize and map fracture-rich zones from conventional well logs, and thus, to better predict such trends in the subsurface for improved exploratory and development drilling.