## ABSTRACT ATOLL CARBONATE RESERVOIR FACIES, HIGGINS RANCH FIELD (CANYON), COKE COUNTY, TEXAS By: S.J. Mazzullo Consultant Midland, Texas

Hydrocarbon production at Higgins Ranch Field is from an anomalously thick (400'+) section of Palo Pinto limestones deposited seawards of the lower Canyon shelf edge and surrounded by coeval and younger, basinal shales. The spatial and stratigraphic occurrence of these limestones, and the carbonate microfacies patterns within the field, suggest an atoll depositional setting for these rocks. Similar atoll deposits, particularly in Palo Pinto and younger Pennsylvanian carbonate rocks, are viable exploration targets in mature areas of the Eastern Shelf province.

The Palo Pinto section in the field consists of thick units of shoal-water limestone separated by thinner tongues of dark colored shales. These shales include graded interbeds of bioclastic debris with shallow-water fossils, and are inter-preted as slope deposits. This facies, which appears to completely encircle the field, grades distally into unfos-

siliferous, basinal shales. The limestone units of the atoll are the reservoir facies in the field. Along the seaward (westward) facing margins of the atoll, these rocks consist of porous biograinstones and coral biolithites. In the interior portion of the atoll, these facies are replaced by biowackestones and porous phylloid algal limestones. Depositional cyclicity is evident within the Palo Pinto section in the field; the carbonate portion of each cycle is a reservoir. Each cycle begins with the establishment of high-energy grainstones and coral biolithites along the seaward margins of the atoll, with low-energy micrite and algal facies deposited in a leeward lagoon. Through time, the high-energy facies prograde lagoonward and eventually infill and overlie the lagoonal deposits. Such progradation probably results from a net lagoonward transport of sediment due to prevailing wind and current directions. Each carbonate cycle is terminated by burial beneath slope facies. Such multiple cycles of atoll limestone development have resulted in a thick limestone section with stacked, non-communicative reservoirs.