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**POSTER ABSTRACT**

## CONVENTIONAL CORING IN CHEVRON'S MANATEE – 1 WELL, TRINIDAD BLOCK 6


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The Manatee-1 well was drilled by Chevron, with partner BG TT, in Block 6d in January 2005 to appraise the northern extent of the Loran/Manatee cross-border gas accumulation. Among the goals of the Manatee-1 well was to acquire conventional core through the principal reservoir sand, QP160, a thick tidal deposit of the paleo-Orinoco River of Pleistocene age. The Manatee-1 core represents one of the most successful shallow cores recovered in the offshore Columbus Basin, especially considering the 48º hole inclination and the low water saturation and unconsolidated nature of the shallow sand.

The success of the Manatee-1 coring operation was based on procedures developed from lessons learned by Chevron in coring operations on similar unconsolidated sands in Venezuelan wells and elsewhere. Three 4" diameter cores, using an 8 ½" core bit and aluminum inner core barrels, were attempted in this very shallow unit from 3,050'-3,158' TVDSS. Three coring runs were involved, first with a 30' barrel then two 60' core barrels. Final recovery for the three cores was a very successful 93%, or 145'/156', Successful downhole procedures employed included use of hydrolift core barrels with a full closure catcher system, synthetic base coring mud with specific low invasion and bridging characteristics, critical mud hydraulics, specialized coring bits, specific coring speeds with an associated WOB and RPM and a slow recovery pull rate. Successful surface procedures included careful laydown procedures, cutting the core barrel to 3' sections, capping and injecting epoxy so as to seal the core without damage. This methodology resulted in maximum core acquisition with no sediment disturbance, and then complete core recovery at the surface with no gas or fluid effects imparted to the sand.

Extensive routine and SCAL analysis of this core provided critical reservoir parameters that underpinned the earth modeling and simulation work for Manatee. Initial core processing included; gamma ray logging, CT scanning, freezing, slabbing and macro-photography. An

extensive sampling program followed, including 147 horizontal plugs taken for routine core measurements, an additional 119 horizontal plugs were taken for SCAL analysis, 36 plugs taken for rock mechanics and 8 samples were taken for biostratigraphic analysis. A suite of 63 plugs having excellent sample quality were selected from the 147' cored interval for detailed analyses including SEM, QXRD and thin section petrography.

Facies distribution and thin-bed interpretation proved to be a critical factor governing gas-in-place within Manatee. Four facies were identified in the core interval; tidal sand flat, tidal mud flat, tidal creek and tidal bar sand. Sand was poor to very well sorted, coarse to medium grained, with moderate volumes of feldspars. Quartz volumes ranged from 37% (tidal mud flat) to 98% (tidal bar) and clay minerals ranged from trace to 37%. Porosities measured in the core plugs were bimodal, with the lower range from 24-30% and the higher, more dominant range from 34-40%. Air permeability ranged from 35md (tidal mud flat) to 15,374md (tidal bar sand). Considerable effort was made to clarify the thin-bedded nature of the tidal mud flat and creek facies which are prominent in the field's smaller reservoirs, yet contain considerable GIIP over the large field area.

Core analyses results were calibrated to wireline logs and OBMI, which enabled an accurate description of the depositional facies of the sand body and the detailed reservoir character of the unit. This work, along with similar analyses from the other three appraisal wells in the field, led to the construction of a high resolution reservoir model which lent significant confidence to the final hydrocarbon volume, and ultimately the equity determination in this cross-border field.