

PS Applications of Scientific Core Drilling in North Carolina: Cumberland-Marlboro ‘Basin’ (Hoke, Scotland and Cumberland Counties), and the Triassic Rift/Lacustrine Dan River Basin (Stokes County), North Carolina*

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Abstract

State-funded continuous coring in the Cumberland-Marlboro ‘basin’ (CMB) and Dan River basin (DRB) was undertaken to further evaluate the hydrocarbon potential of the State’s on-shore Triassic rift / lacustrine basins. The CMB, a large negative aeromagnetic anomaly buried beneath a thin (200-400-foot-thick) Coastal Plain cover, is strike parallel and seaward of the Deep River Triassic rift basin assessed by the USGS for hydrocarbon potential. Geologic literature postulated the presence of a Triassic rift / lacustrine basin. The state groundwater well database (GW-1) provided equivocal data as to the presence of Triassic strata. Two basement studies presented equivocal data that could be interpreted either as paleo-weathering of metavolcanic rocks or Triassic strata. Three rotasonic drill holes advanced into the basement recovered four-inch diameter cores along the CMB anomaly’s strike extent and encountered metavolcanic rocks. Thin section study confirmed metavolcanic basement rock. Thus, a large Triassic rift / lacustrine basin is not present; however, the presence of a very small rift / lacustrine basin like that of Bertie County, NC, cannot be precluded in NC and SC. The DRB 1,477-foot continuous wire line core hole (SO-C-1-15) penetrated in descending stratigraphic order – Dry Fork Formation, Walnut Cove Formation the Pine Hall Formation and terminated in metavolcanic basement rocks below surface at a depth of 1,451 ft. The core penetrated the 325-foot thick Walnut Cove Formation (the lacustrine source rock) from a drilled depth of about 98 to 424 ft containing previously unreported gassy coals, coaly intervals, and coarse silt intervals. Beginning at a depth of 253.1 ft, the sidetrack core hole (SO-C-1A-15) recovered a three-foot coal and coaly section followed by organic mudstone interspersed with siltstone that outgassed. Fluid inclusion stratigraphy confirmed the presence of hydrocarbons, and a petroleum system. The DRB core hole confirms the Walnut Cove Formation’s down dip continuity and thickness, and may become the future type section for the Pine Hall Fm. Organic geochemistry (TOC, %Ro), thermal maturity, mineralogy, rock mechanics, MICP porosity and permeability, and pore studies are in progress. Rock mechanics and mineralogy data will provide velocities for potential future industry seismic surveys.

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