

Reservoir characterization study: porosity, permeability, petrography, and facies analysis of Tertiary to Mississippian age outcrop samples, eastcentral Brooks Range Foothills and North Slope, Alaska

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A reservoir characterization study based on surface geologic mapping, facies analysis, petrography, porosity, and permeability focuses on the siliciclastic Upper Cretaceous Tuluva Formation in particular, and on other Cretaceous to Mississippian units in general. The data yield significant reservoir characterization and bear on petroleum resource assessment for Prudhoe Bay satellite fields, new play-type evaluations, and surface and subsurface stratigraphic correlations of the eastern Colville basin. Outcrop samples are part of the parautochthonous and autochthonous Brookian sequence that crops out in the Brooks Range foothills, and the allochthonous Ellesmerian sequence that crops out along the Brooks Range mountain front. The foreland basin succession (Brookian) lies north of the Brooks Range fold-and-thrust belt, and prograded north, onlapping the south flank of the Beaufort sill, which separates the Colville Basin from the Canada Basin in the Arctic Ocean. Stratigraphy is part of the 1,000 km-long and 50 to 350 km-wide Colville Basin, which, in the subsurface forms reservoir and source rocks for Prudhoe Bay and satellite fields.

Sampled North Slope and Brooks Range foothills stratigraphy includes: Tuluva Formation (Upper Cretaceous – Turonian to Coniacian), Schrader Bluff Formation (Upper Cretaceous), Nanushuk Formation (Lower Cretaceous), Gilead sandstone (Lower Cretaceous), Torok Formation (Lower Cretaceous), Fortress Mountain Formation (Lower Cretaceous - Albian), Cobblestone sandstone (Lower Cretaceous - Albian), Karen Creek Sandstone (Triassic), Otuk (Triassic), and Lisburne Limestone (Mississippian). Some of the more significant porosity and Klinkenberg permeability data include:

TULUVAK FORMATION---8-19% POROSITY, 0.5-8,000 MILLIDARCY (MD)
NANUSHUK FORMATION---3-14%, 0.005-247 MD
GILEAD SANDSTONE---5- 6%, 0.001 MD
FORTRESS MOUNTAIN FORMATION---3-8%, 0.1, 12 MD
COBBLESTONE MEMBER OF FORTRESS MOUNTAIN FORMATION---2%, 0.001 MD
LISBURNE GROUP---1.4-2.8%, 0.1-0.4 MD

These data indicate that the Tuluva Formation and Nanushuk Formation commonly include good quality reservoir sandstone in the eastern end of the Colville basin.