

## Potential Reservoir Facies in the Nanushuk Formation (Albian-Cenomanian), Central North Slope, Alaska: Examples from Outcrop and Core

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The Albian-Cenomanian Nanushuk Formation is a thick regressive fluvial-deltaic-shelf succession that crops out in the foothills north of the Brooks Range and is present in the subsurface throughout most of the National Petroleum Reserve-Alaska (NPRA). Three major facies assemblages are recognized in the Nanushuk Formation in outcrop at Rooftop Ridge and Ninuluk Bluff, and in the subsurface in the Grandstand, Square Lake 1, Wolf Creek 3, and Fish Creek 1 wells, including offshore, shoreface-delta-front, and bay fill assemblages. In the eastern NPRA and northern foothills belt, the shoreface-delta-front assemblage is the most common facies. Individual shoreface-delta-front deposits are arranged in coarsening-upward successions from 30 feet to over 100 feet thick that stack to form thicker regressive coarsening-upward successions bounded by distinct flooding surfaces. Sandstones of this assemblage are characterized by abundant storm wave-generated structures, suggesting that the shorezone in this area was significantly wave influenced, if not wave-dominated. Near the top of thicker regressive successions, shoreface-delta-front deposits lack appreciable mudstone and sandstones are amalgamated forming relatively thick bodies. Elements of the bay fill assemblage are present at the top of the Nanushuk Formation in outcrop at Ninuluk Bluff and in the subsurface in the Square Lake 1 well, where they are interpreted as an estuarine(?) complex. A possible sharp-based shoreface succession truncates the estuarine(?) complex at Ninuluk Bluff and is, itself, truncated by a major sequence-bounding unconformity at the base of the Seabee Formation (Turonian). This surface has also been recognized in the Square Lake 1 well and at Rooftop Ridge, demonstrating its regional extent.

Reservoir potential is greatest in the shoreface-delta-front assemblage where constant wave activity has winnowed fine-grained material and reduced the volume of ductile framework grains. Stacked amalgamated shoreface-delta-front sandstones in the Nanushuk Formation may form thick potential reservoir units. Possible shoreward pinchout in backshore and bay fill mudstones may provide opportunities for stratigraphic traps in the shoreface-delta-front assemblage. Thick sandstone accumulations in estuarine settings, such as recognized at Ninuluk Bluff, may represent secondary reservoir targets.