

An Integrated Outcrop and Subsurface Facies Analysis of the Albian-Cenomanian Nanushuk Formation near Umiat, National Petroleum Reserve, Alaska

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The Albian-Cenomanian Nanushuk Formation consists of marine to non-marine sandstones and mudstones deposited in the foreland basin of the ancestral Brooks Range. The widespread occurrence of the Nanushuk Fm. in the subsurface of the North Slope and in outcrop along the Brooks Range fold-and-thrust belt has led to numerous studies. Previous workers have shown that the Nanushuk Fm. is largely deltaic to shallow marine in origin, but varies considerably from west to east, reflecting changing source areas and the relative influence of wave and storm processes on coastal deposits.

Current research is directed towards the development of a high-resolution facies model for the Nanushuk Fm. near Umiat, Alaska, combining independent study of cores and outcrop with published well log and core analyses from public and private sources. Geological data will be incorporated into a larger reservoir model for the Umiat anticline, which is thought to hold as much as 200-300 MMBO of recoverable reserves. The shallow depth of the reservoir (275-1250 ft), which lies partly within the permafrost zone, complicates the recovery efforts and amplifies the need for a detailed facies model.

Investigations began with analyses of cores from five of the twelve vertical wells drilled in the Umiat anticline. Results confirm the presence of delta plain, shoreface, delta-front, and prodelta depositional systems described in earlier reports. Measured sections from cores detail vertical changes in facies successions and depositional sequences. Unfortunately the cores are sparse considering the overall area of the anticline, and many of the cores are in poor condition, often unslabbed or heavily sampled. As a result, they do not provide sufficient information for more advanced studies of sedimentary structures, or for an assessment of lateral variability in depositional environments. Both of these characteristics have a major impact on porosity and permeability within the reservoir. Measured sections from outcrop provide the additional context required to address questions about sedimentary structures and stratigraphic architecture critical to the development of a high-resolution facies model.