

Reservoir Characterization, Source Rock Potential, Fossil Fuel Resources and Basin Analyses, Bristol Bay Basin, AK

DE-FC26-01NT41248 3.04.1

Program

The project was selected through the Arctic Energy Office grant to the Arctic Energy Technology Development Laboratory at the University of Alaska-Fairbanks (UAF).

Project Goal

The goal is to create a publicly available, modern, basin analysis and hydrocarbon assessment of the Bristol Bay Basin.

Performers

*University of Alaska, Fairbanks (UAF)
Fairbanks, AK*

*Alaska Division of Geological and Geophysical Surveys (DGGs)
Fairbanks, AK*

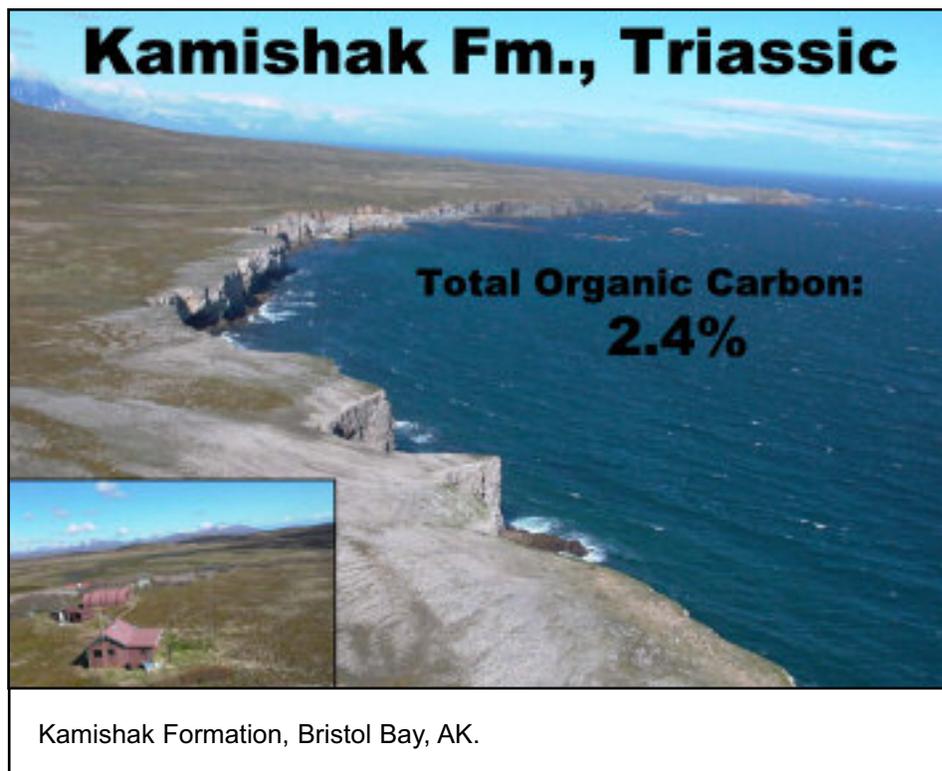
*Alaska Division of Oil and Gas (DOG)
Fairbanks, AK*

Project Results

Field work was conducted in a 22-day, two-phase program in the Bristol Bay-Alaska Peninsula region. The program's first phase focused on source rock potential of the Mesozoic section. The second phase focused on reservoir potential and stratigraphic architecture of Tertiary rocks. Data included rock sample details and field station locations, headspace gas analyses, whole oil geochemistry, organic geochemistry, total organic carbon, kerogen typing, porosity and permeability, and inorganic geochemistry. Separate reports from DGGs summarize the megafossil data and the measured stratigraphic sections. Both bear on surface-to-subsurface stratigraphic correlations.

Benefits

The research will provide an up-to-date hydrocarbon assessment based on reservoir characterization that in turn is based on porosity, permeability, petrography, measured sections, seismic, and well logs. Microfossil samples will be collected and used to tie outcrop data to wells. The analysis will provide exploration companies with valuable information on source rock potential and oil characterization.



Background

More than 20 wells have been drilled on the Alaska Peninsula; most reported oil and gas shows, but none has produced. A three-year collaboration among DGGs, DOG, UAF, Bristol Bay Native Corporation, and the Alaska Energy Technology Development Laboratory has been established with the goal of reassessing this frontier basin.

Project Summary

The Triassic Kamishak Formation, composed in part of shallow-water biohermal limestone, yields total organic carbon (TOC) content of 2.4%, HI of 598 and 474, and OI averaging 21.5. A similar muddy limestone from the same section yields 1.12% TOC. Oil seeps (0.5 barrels per day, API gravity ~18°) from the Jurassic Shelikof Formation, and the associated gas at Oil Creek is 91% methane, 7% nitrogen, and 2% carbon dioxide.

The Middle Jurassic Kialagvik Formation was only locally sampled but generates TOC values from 0.54 to 0.81%. One sample collected from the Snug Harbor Member of the Upper Jurassic Naknek Formation produces a TOC value of 2.9%. The lower part of the Naknek Formation locally yields good porosity and permeability—2-8% and 0.005-300 millidarcies. This part of the section also has tens of meters (m) of outcrop that is oil-charged.

Additional sampling is scheduled for the 2005 field season.

The Miocene Bear Lake (BLF) and the Pliocene Milky River (MRF) formations are exposed along the coast near Port Moller on the Alaska Peninsula and in the mountains to the northeast. The BLF may be as thick as 1,000 m in outcrop and is 2,368 m thick in the Gulf Sandy River Federal No. 1 well. The MRF is 465 m thick at its type locality onshore and may be 1,012 m thick in the Sandy River No. 1 borehole. The BLF has produced oil shows in offshore exploration wells and is considered to be one of the primary potential reservoirs in this frontier basin. Ongoing stratigraphic analysis of the BLF indicates that it consists of three major facies associations. The lower part of the BLF was deposited in subtidal to shelf environments in a sand-dominated estuarine system. The middle part of the BLF is interpreted to have been deposited in intertidal and subtidal channels and tidal flat environments. The upper part of the BLF section represents a fluvial-dominated part of the estuarine system. Ongoing palynological, porosity/permeability, and TOC sampling is to be conducted during the 2005 field season to evaluate the reservoir potential of each of these facies associations.

An angular unconformity defines the contact between the steeply dipping and local-

ly tightly folded BLF and the gently dipping MRF. Publicly available seismic data suggest that this unconformity may be a regional feature, but its characteristics change offshore, particularly in the North Aleutian Shelf COST No. 1 well area. There, it appears to be both an unconformity and a downlap surface, with clinofolds of the MRF prograding northward over the BLF. Continuing surface stratigraphic and subsurface studies should help to evaluate the lateral extent of this apparently regionally significant unconformity.

Current Status (August 2005)

The project is in its second field season.



Bear Lake Formation, Bristol Bay, AK.

Project Start: September 29, 2004

Project End: September 30, 2006

Anticipated DOE Contribution: \$466,000

Performer Contribution: \$145,000 (25% of total)

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