

MMS

U.S. Department of the Interior
Minerals Management Service
Alaska OCS Region

Exploring the Frontier— Alaska's Cook Inlet

Geographic Setting

The Cook Inlet program area lies in southcentral Alaska between the Kenai Peninsula and the Kodiak Islands to the south and east and the Alaska Peninsula to the north and west. The northern boundary lies three miles south of Kalgin Island and the southern boundary extends into the northern part of Shelikof Strait. Water depths range from 44 feet in the north near Kalgin Island to over 600 feet in Shelikof Strait. Tidal currents are very strong in Cook Inlet due to the unusually high tidal range. Those currents have a profound impact on offshore seismic surveying. Seasonal ice flows may limit winter exploration activity in some parts of the Inlet.

Data Availability

Data from ten exploratory wells and the Arco COST (Continental Offshore Stratigraphic Test) No. 1 well in Federal waters are publicly available from MMS. There are also data from wells onshore and in State waters near the program area available from the State of Alaska. More than 4,000 line-miles of seismic data were shot for speculative sale in the program area since 1979. Those data are available from Western Geophysical Company and Digicon Geophysical Corp. There are also 3,730 line-miles of seismic data shot in 1975 and 1976 that are publicly

available from the National Geophysical Data Center in Boulder, Colorado.

Basin Description

Cook Inlet is part of a large forearc basin that lies between the Aleutian Trench and the active volcanic arc on the Alaska Peninsula. The southeastern boundary of the basin is the Border Ranges fault, which separates the sedimentary basin from the metamorphic rocks of a large accretionary complex exposed in the Chugach and Kenai Mountains. The northwestern boundary of the basin is the Bruin Bay fault, which separates the basin from igneous rocks of the Alaska-Aleutian Range batholith exposed on the Alaska Peninsula. The Augustine-Seldovia arch separates the basin into two depocenters. The northern depocenter in Upper Cook Inlet contains as much as 25,000 feet of Tertiary strata. The southern depocenter in Lower Cook Inlet and Shelikof Strait contains a thin Tertiary section over as much as 36,000 feet of Mesozoic strata.

Previous Exploration and Production

All of the oil and gas fields discovered in the Cook Inlet basin to date are in State waters or onshore. The first oil field was discovered at Swanson River on the Kenai Peninsula in 1957, and production began in 1959. The first gas field was discovered at Kenai in 1959, and

production began in 1961. Offshore oil production began in State waters at the Middle Ground Shoal field in 1967. Offshore gas production began at the North Cook Inlet field in 1969. In 2000, Forest Oil installed the most recent offshore platform at the Redoubt Shoal field. Sixteen offshore platforms are currently active in Upper Cook Inlet.

The oil fields in Upper Cook Inlet produce from non-marine sandstone and conglomerate reservoirs of Tertiary age in northeast-trending anticlines. The oil source is thought to be marine strata of Middle Jurassic age. Approximately 1.3 billion barrels of oil have been produced from the basin to date. Remaining oil reserves range from 125 to 325 million barrels, depending on the size of recent developments, such as the Redoubt Shoal field. The largest oil field discovered in the basin is the offshore McArthur River field, at 617 million barrels recoverable.

The gas fields contain deposits of biogenic methane in non-marine sandstone reservoirs of Late Tertiary age. The gas sources are coal beds and organic siltstones throughout the Tertiary strata. Approximately 6.5 trillion cubic feet of gas have been produced from the basin to date. Remaining gas reserves are approximately 2.5 trillion cubic feet. The largest gas field discovered in the basin is the Kenai field, at 2.4 trillion cubic feet recoverable.

The first well in Lower Cook Inlet, the Arco COST No. 1 well, was drilled to a total depth of 12,387 feet in 1977. It bottomed in marine sandstone and shale of Late Jurassic age. Three Federal OCS lease sales were held between 1977 and 1997. Altogether, 102 tracts were leased for a total of \$403,130,000. From 1978 through

1985, thirteen exploratory wells were drilled in Lower Cook Inlet. Three of those wells were abandoned at shallow depths and they were redrilled at approximately the same locations, so ten prospects were tested in the thirteen wells. The deepest penetration was 14,940 feet in the Arco Y-0161 well, which bottomed in strata of Early Jurassic age. All of the wells were plugged and abandoned with no discoveries announced. Two wells had significant oil shows in Late Cretaceous strata. Both of those wells, the Marathon Y-0086 well and the Arco Y-0097 well, tested non-commercial oil with low flow-rates in drillstem tests. The Chevron Y-0243 well had minor oil shows, but was not tested.

Recent Exploration

Recent exploration near Lower Cook Inlet involves both oil and gas prospects. Phillips Alaska Inc completed a well in 2002 in the Cosmopolitan Unit, which includes two offshore Federal leases. That well was directionally drilled from an onshore location and was designed to encounter an oil-bearing interval discovered in 1967 in the Pennzoil Starichkof State well. The reservoir rocks are in Tertiary-aged formations.

Marathon Oil Co and Unocal Alaska have recovered gas from a well on the Ninilchik Exploration Unit onshore. Those two companies have proposed building a new pipeline to connect the Ninilchik Unit with the existing pipeline network and to serve new areas on the southern Kenai Peninsula.

Future Potential

The Mesozoic section in Lower Cook Inlet contains marine strata from Late Triassic through Late Cretaceous age. Late Triassic limestone and chert beds

appear to have excellent source-rock potential. The rocks are organic rich with oil-prone kerogen types. Those beds probably underlie the offshore area, although the OCS wells were too shallow to encounter them. The Middle Jurassic strata contain proven oil source-beds in marine siltstones.

Early Cretaceous sandstones have good reservoir-rock potential, but the beds are relatively thin. Late Cretaceous sandstones have the best reservoir-rock potential in the Mesozoic section. They occur in submarine fan and fan-delta deposits in both stratigraphic and structural traps. Oil pools were encountered in Late Cretaceous strata in two of the wells (Marathon Y-0086 and Arco Y-0097), so the petroleum system is viable.

The area in Lower Cook Inlet north of the Augustine-Seldovia arch contains a thick Tertiary section. That area, while limited in areal extent, has good reservoir-rock potential in nonmarine sandstone and conglomerate beds. Those rocks are correlative with the producing strata of Upper Cook Inlet.

Assessment Results

A year 2000 assessment of the Lower Cook Inlet planning area estimated that the endowments of conventionally recoverable resources average 760 million barrels of oil and 1.39 trillion cubic feet of gas. The resource model forecasts 62 oil pools and 17 gas pools, with a few large enough to exceed the minimum threshold for economic development. A price-supply graph summarizes the economic results and indicates that 450 million barrels (risked) of oil are economically recoverable at \$18/bbl (mean or average case), and 620 million barrels (risked) are economically recoverable at \$30/bbl (mean case). The high side oil potential

ranges from 990 to 1,160 million barrels (\$18/bbl to \$30/bbl). The price-supply graph for gas indicates that 600 billion cubic feet (risked) are economically recoverable at \$2.11/mcf (mean case), and 1.0 trillion cubic feet (risked) are economically recoverable at \$3.52/mcf (mean case). The high side gas potential ranges from 1.28 to 1.69 trillion cubic feet (\$2.11/mcf to \$3.52/mcf).

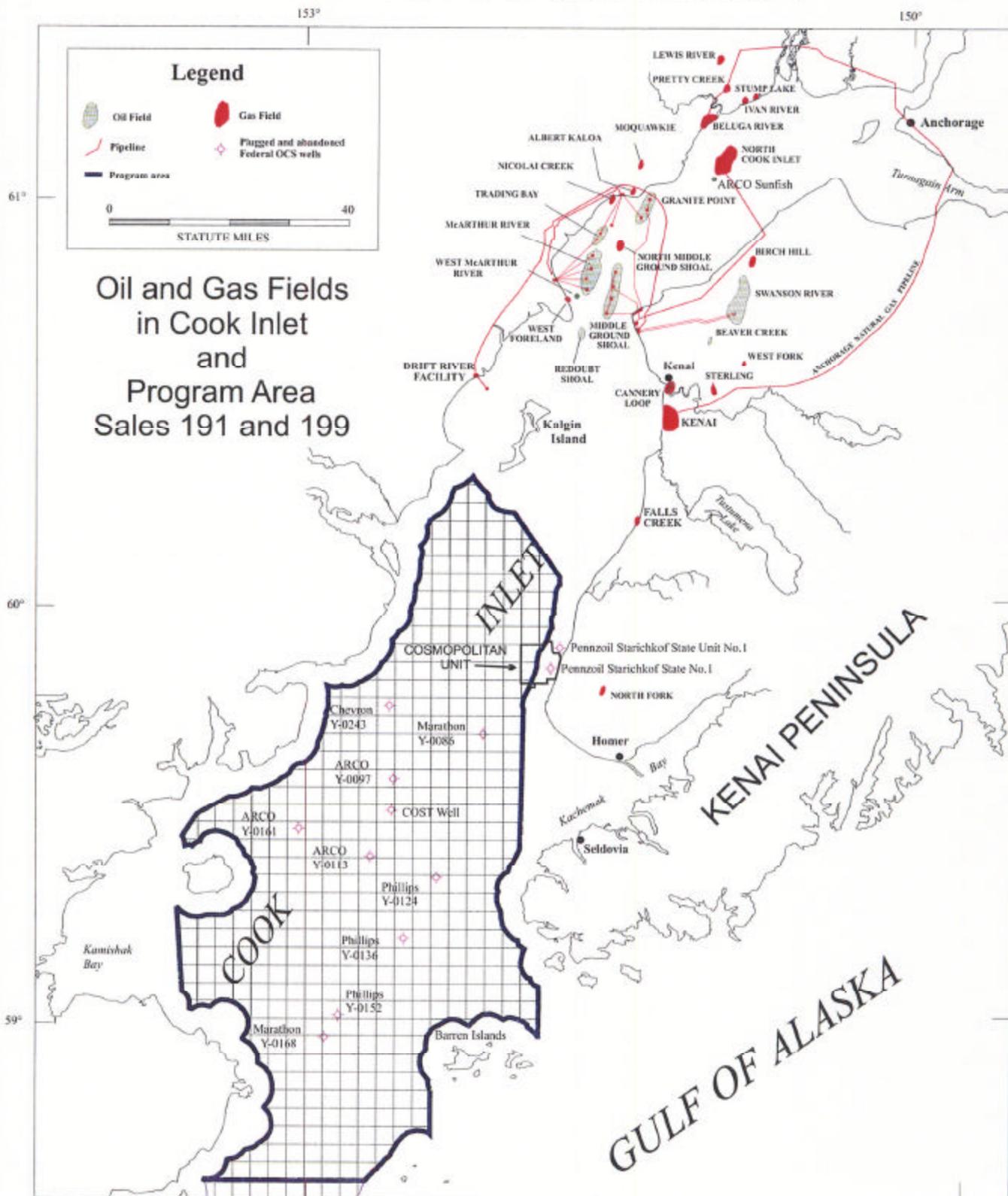
The economic model assumed offshore pipelines would transport oil to production facilities in the Nikiski area. From Nikiski, the oil will be used locally or transported by tankers to the West Coast. The Nikiski refinery receives about sixty tankers of North Slope crude oil from Valdez annually, so a new discovery would help decrease oil tanker traffic from Valdez.

The economic model assumed gas would be transported by pipeline to the Kenai area to tie in to the existing pipeline network. Residential, utility, and industrial customers would consume the gas locally in the Anchorage and Kenai Peninsula market. Known reserves of gas are adequate for approximately ten years at the current rate of consumption. New discoveries will be required to meet the existing demand and any growth in the local market.

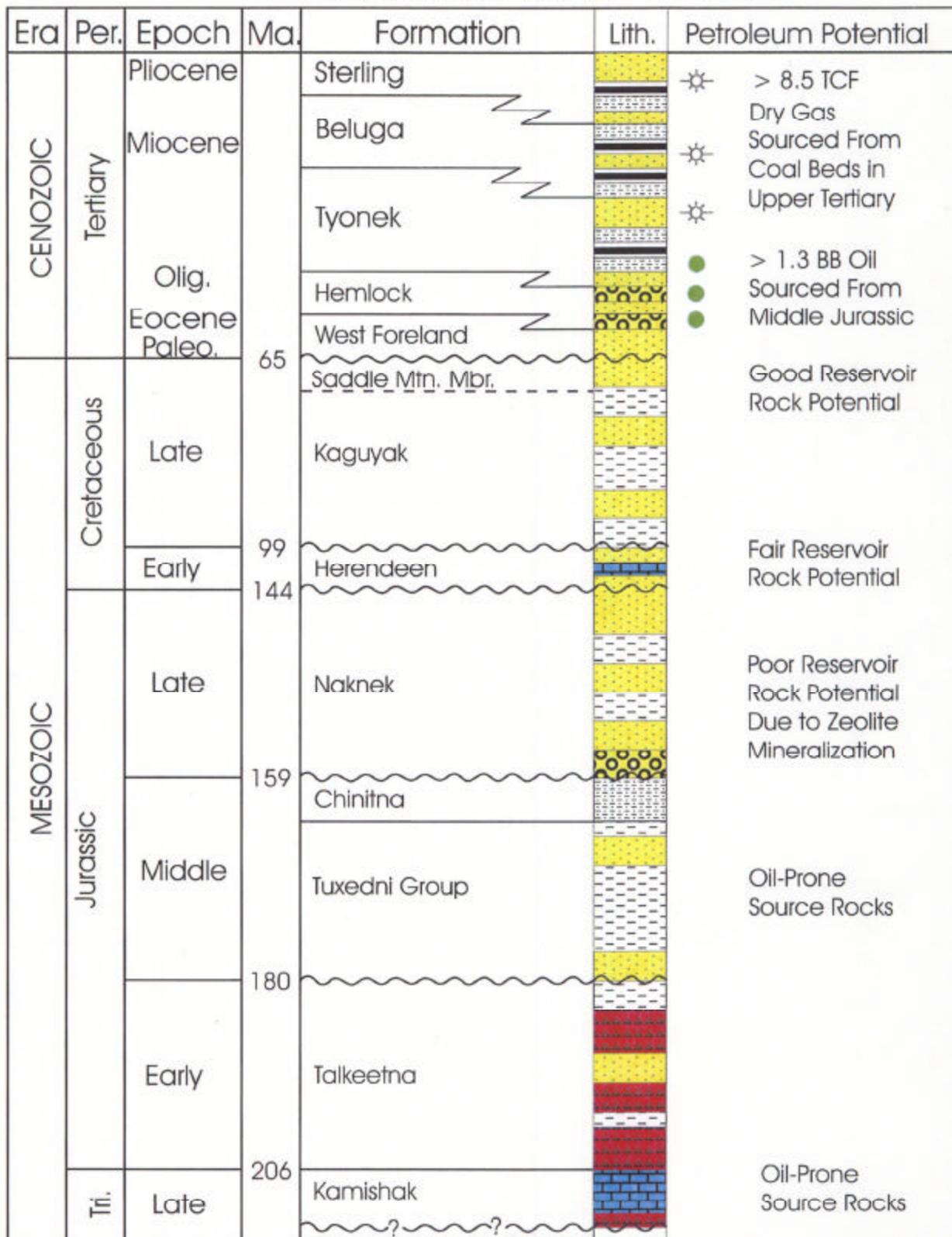
Lower Cook Inlet
RISKED, UNDISCOVERED OIL AND GAS

RESOURCE CATEGORY	OIL AND NGL (Bbo)				GAS (Tcfg)	
	F ₉₅	MEAN	F ₀₅	F ₉₅	MEAN	F ₀₅
CONVENTIONALLY RECOVERABLE	0.34	0.76	1.42	0.66	1.39	2.49
ECONOMICALLY RECOVERABLE AT \$18/BBL OIL PRICE (and \$2.11/mcf GAS PRICE)	0.06	0.45	0.99	0.10	0.60	1.28
ECONOMICALLY RECOVERABLE AT \$30/BBL OIL PRICE (and \$3.52/mcf GAS PRICE)	0.21	0.62	1.16	0.46	1.00	1.69

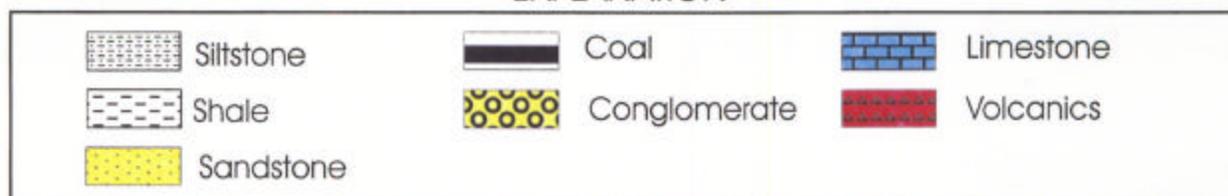
LOWER COOK INLET PROGRAM AREA AND INFRASTRUCTURE



COOK INLET STRATIGRAPHIC COLUMN



EXPLANATION

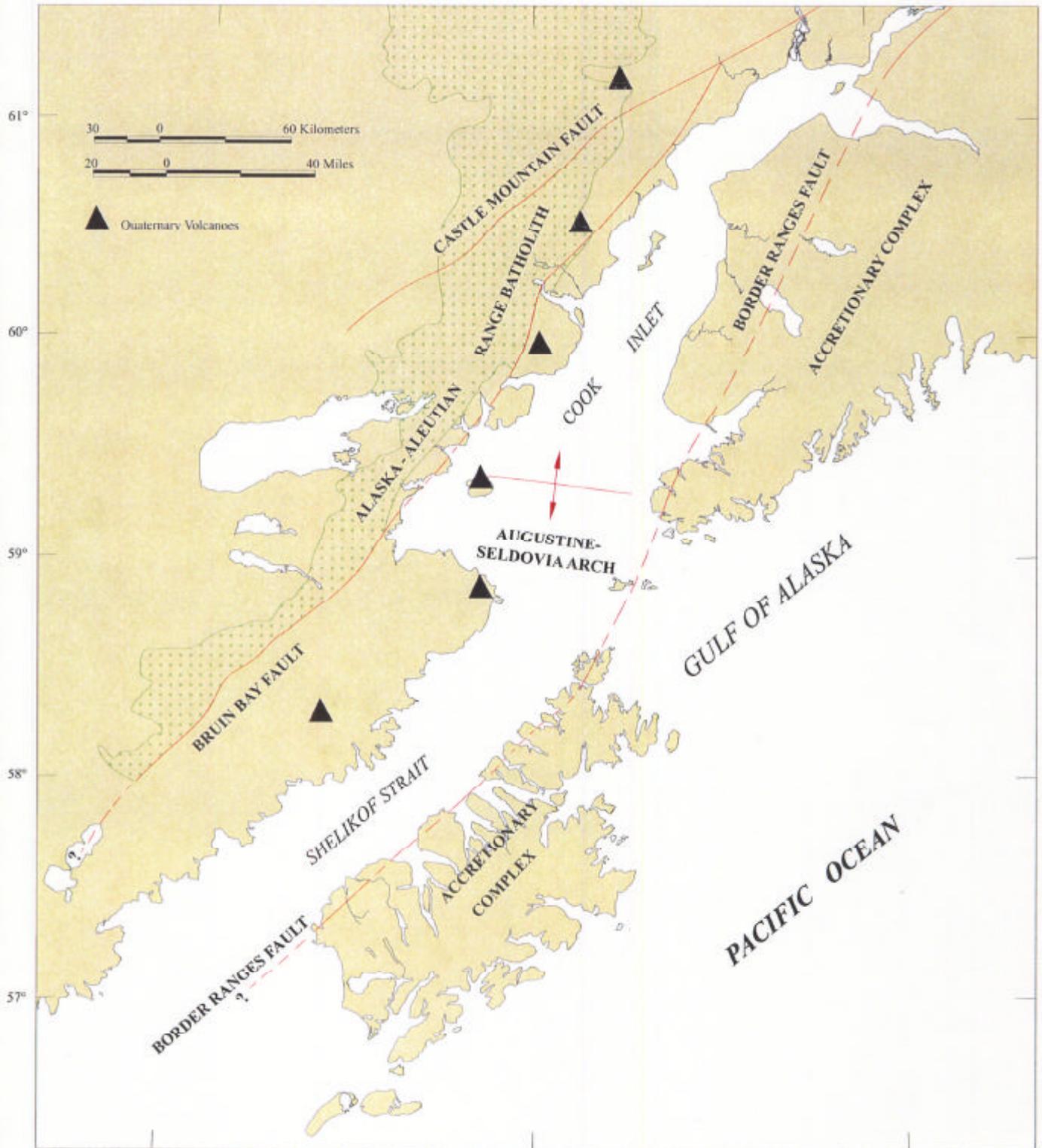


MAJOR STRUCTURAL FEATURES OF THE COOK INLET FOREARC BASIN

156°

153°

150°



LOWER COOK INLET OCS PLANNING AREA

Economically Recoverable Oil and Gas Resources

Economically Recoverable Gas (Bcf)

200 600 1000 1400 1800

