

OIL AND GAS POTENTIAL OF PORTIONS OF
LARIMER AND WELD COUNTIES, COLORADO

BY

Kathleen L. Cox

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A thesis submitted to the Faculty and Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science.

Signed: Kathleen I. Cox
Student

Golden, Colorado

Date: September 8, 1973

ARTHUR H. HARRIS
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

Approved: John D. Hawn
Thesis Advisor
Harry C. Kent
Head of Department

Golden, Colorado

Date: October 4, 1973

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ARTHUR LAYNE MERRARY
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

ABSTRACT

A study of the oil and gas potential of portions of Larimer and Weld Counties, Colorado, was undertaken as part of the Windsor Project of the Colorado State Geological Survey. Emphasis was placed on three formations; Lyons Sandstone (Permian); Muddy-"J" Sandstone (Lower Cretaceous); and the sandstone members of the Pierre Shale (Upper Cretaceous).

The Lyons Sandstone was deposited, in part, as an aeolian sand with the environment changing from beach to marine eastward into the area of the Denver basin. Dimelow (1972) believes that cementation of the sandstone is related to the depositional environment -- silica cementing aeolian sandstones, and calcite, anhydrite, and gypsum cementing marine sandstones. Dimelow traced the migration of hydrocarbons in the Lyons by examination of bleaching, that is, the geographic distribution of the creamy facies. Source beds were believed to be the Phosphoria Formation in western Wyoming.

The Muddy-"J" Sandstone, part of the Dakota Group, is divided into two members in the area. The lower Fort Collins Member is a poorly bedded, very fine-grained silty sandstone

believed to have been deposited in a regressive shoal-water marine environment (MacKenzie, 1971). The Horsetooth Member is a high-angle cross-stratified, well-sorted, fine-grained sandstone and was deposited as a partially wave-reworked distributary channel sand (MacKenzie, 1971). The Horsetooth Member contains oil and gas pools in the Denver basin.

The sandstone members of the Pierre Shale, in ascending order, are the Hygiene, Terry, Rocky Ridge, Larimer, and Richard. All the sandstones are micaceous, clayey, silty, glauconitic, and poorly sorted. Faunal collections include ammonites, Inoceramus fragments, and Ophiomorpha burrows. Outcrop and subsurface isopach geometry indicates that these sandstones were deposited as marine bars, with north-south elongation. Transport directions indicate that the bars accreted southward. The shoreline at the time of sand deposition was north and west of the study area.

The Pierre Shale sandstones have been correlated with sandstones within an approximately equivalent interval of the Cody Shale of Wyoming. Wyoming terminology has been mistakenly used in the Denver basin. Gill and Cobban (1966) have studied the Pierre Shale in the western interior and have shown, by the use of ammonites, that the Colorado Hygiene and Terry Members are not the time equivalent of the Wyoming Sussex. Colorado outcrop terminology is recommended for use in the Denver basin.

The oil and gas potential is estimated by comparison of

possible producing formations with formations that contain established production. The six petroleum producing structural features within the area are the Antelope anticlinal nose, and the Black Hollow, Fort Collins, Loveland, New Windsor, and Pierce anticlines. The Lyons Sandstone contains two multimillion-barrel fields, but it is believed to have no additional petroleum potential within the area. Within the Dakota Group, gas production from the Muddy Sandstone in the Wattenberg field is being extended northward into the area. Additional gas and perhaps oil could be discovered in the Muddy. The lower part of the Dakota Group, including the Plainview, "Fuson", and "Lakota", also may contain undiscovered petroleum. The Codell-Timpas strata have a poor chance for significant discoveries. The shale part of the Niobrara Formation may have several half-million barrel fields as yet undiscovered.

Until recently the Pierre Shale sandstone members have been ignored as exploration targets, much as the lower part of the Dakota Group. No major undiscovered fields are believed present, but there may be several half-million barrel fields. There is also the possibility of gas near Loveland in all the sandstones, and gas near Fort Collins in the Hygiene Member.

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