NEW MEXICO OIL CONSERVATION COMMISSION

CASE NUMBER 1556:

CHACO OIL COMPANY'S APPLICATION FOR AN EXCEPTION TO RULE 104 in RED MOUNTAIN FIELD

November 19, 1958

BEFORE EXAMINER UTZ
OIL CONSERVATION COMMISSION
_____ EXHIBIT NO. ___
CASE NO. ___

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NEW MEXICO OIL CONSERVATION COMMISSION CASE 1556: CHACO OIL COMPANY'S APPLICATION FOR AN EXCEPTION TO RULE 104. GEOLOGY, PRODUCTION, OIL RESERVES, AND ECONOMICS OF RED MOUNTAIN FIELD, McKINLEY COUNTY, N. M.

INTRODUCTION

Location

The Red Mountain Field is located in sections 20 and 29, Township 20 North, Range 9 West, in northern McKinley County, New Mexico. The field is 55 air miles north of Grants, 50 air miles west of Cuba, 57 air miles south-southeast of Farmington and 93 air miles northwest of Albuquerque.

Access

The field is reached via 59 miles of dirt road from U. S. Highway 66 at Prewitt, New Mexico, or by 40 miles of dirt road from a point on State Road 44 which is 34 miles west of Cuba. The road is subject to occasional washouts from summer thunderstorms.

HISTORY

Production was discovered on the Red Mountain structure by the Stacey, Webber et. al. No. 1 Santa Fe in Section 29, Township 20 North, Range 9 West, in June of 1934. The discovery well was completed for a reported daily potential of 5 barrels of oil from a Mesaverde sand at 475 to 498 feet. During the next three years approximately 25 wells were drilled,

of which 7 were reported productive. State records indicate cumulative production in excess of 23,000 barrels through 1957. However, since the field was discovered prior to the establishment of the Oil Conservation Commission, production and technical data now available are incomplete and unreliable. The productive area of the field, now covered by a lease from the Santa Fe Pacific Railroad Company on the South ½ of Section 20 and the North ½ of Section 29, has changed hands intermittently since the field discovery. In 1955 this lease was assigned to Ben and Celia Sapir. In November of 1957, operation of this lease was assumed by Chaco Oil Company, a joint venture of Ben Sapir and Henry S. Birdseye.

In July, 1958, Chaco Oil Company drilled a Morrison test in the southeast quarter of Section 20. Bottomed at a total depth of 3936 feet, this well was plugged and abandoned after encountering gas-cut salt water in the Dakota formation.

A series of ten stratigraphic holes 200 to 300 feet in depth was drilled in the early part of 1958, and served to establish subsurface control for the delineation of the structure, as shown in Exhibit D.

GEOLOGIC SETTING

Physiography

The Red Mountain structure is situated in a broad strike valley in shale members of the Mesaverde formation some two miles south of the escarpment known as Chacra Mesa, which is capped by the uppermost member of the Mesaverde Group, the

Cliff House sandstone. Topographic relief in this portion of the San Juan Basin is generally slight, interrupted by occasional buttes capped by erosion-resistant sandstone beds.

Structure

In a regional sense, the Red Mountain field is on the Chaco slope between the Zuni Uplift to the south and the San Juan Basin to the north. Regional dip is to the northeast at an average of about 100 feet per mile. On the south flank of the San Juan Basin, local structural reversal has played an important role in the accumulation of oil at the Hospah field, which has produced more than 3½ million barrels from an area of about 400 acres on a small north-trending, faulted anticline. Various other small structures in this area have been drilled with negative results, probably in large part because of unfavorable stratigraphic and hydrodynamic conditions. The Red Mountain structure has been mapped by personnel of the U. S. Geological Survey as an anticline within a wedge-shaped, downdropped fault block. Outcrops do not provide clear surface expression of the fold. However, it is apparent that structural reversal is present aside from fault closure, possibly accenting a fault trap.

Stratigraphy

Surface exposures on the Red Mountain structure are of the Menefee formation of the Mesaverde Group. The uppermost beds of the Menefee Formation and the entire Cliff House Formation have been removed by erosion. The approximate strat-

igraphic section (through the Triassic only) at this locality is as follows:

PERIOD	FORMATION	DEPTH
Upper Cretaceous	Menefee Fm.	Surface
	Point Lookout ss.	1650'
	Crevasse Canyon Fm.	1760'
	Hospah ss.	2690'
	Gallup ss.	2750'
	Lower Mancos	2860'
	Dakota ss.	3710'
Jurassic	Morrison Fm.	3920'
	Todilto gypsum	4900'
	Entrada ss.	4975'
Triassic	Chinle sh.	5300'
	Shinarump(Agua Zarca)ss.	5965'
	Moenkopi Fm.	6080'

FACTORS AFFECTING HYDROCARBON ACCUMULATION

While the majority of oil and gas fields in the San Juan Basin to the north are controlled almost entirely by variations in porosity and permeability, production on the south flank of the Basin, as at Stoney Butte, Red Mountain and Hospah, is dominantly controlled by structural features, with minor control by lenticularity of producing sands. Extensive wildcat drilling by various operators to the north, east, south and west of Red Mountain has failed to establish production where structure is

absent, even though lenticularity of porosity and permeability may be present. This is probably the result of excessive water saturations due to the proximity of recharging outcrops to the south. The only examples of stratigraphic entrapment in this area are found at Seven Lakes 14 miles southwest of Red Mountain and in the Torreon area some 20 miles east of Red Mountain, where lenticularity has permitted the segregation of minor quantities of oil independent of structure. Thus exploration has rather clearly established that structural closure, either by faulting or folding or both, is important to commercial oil accumulations within a few tens of miles of the outcrops on the south flank of the San Juan Basin.

Vertical closure in the important Hospah field is at least 100 feet. The amount of closure on the Red Mountain structure has not yet been established; however, it is considered possible that at least 100 feet of closure may be established as a result of future development. Rather sparse subsurface control has shown considerable lenticularity in the Menefee producing zone at Red Mountain. An attempt has been made to estimate the area which has been drained during the production of some 25,000 barrels of oil to date. As shown on Exhibit D, the depleted area of about 17 acres lies northwest (down-dip) from the axis of the nosing or dome. This is probably the result of a tilted water table, due to the hydrodynamic potential of the recharging outcrops to the south. However, data from the wells drilled years ago to the

"450-foot" sand are so inconclusive that it cannot be definitely stated that this is so; therefore, at least one well is projected to test the structurally-high area southeast of present production.

NEED FOR ADDITIONAL DEVELOPMENT

Production of oil from the "450-foot" zone of the Menefee Formation at Red Mountain has totalled about 25,290 barrels to date. Four wells are now productive, with a daily capacity of about eight barrels, which is barely sufficient to pay the costs of operating the property. It is the contention of Chaco Oil Company that additional wells, drilled within the two 40-acre proration units now producing, and completed by modern techniques, should substantially raise the productive capacity of the shallow pay without necessitating an increase in the allowables for the two proration units, for the following reasons:

(1) Reservoir Drive: the quantity of gas produced with oil is so slight as to be unmeasureable. It is evident from the amount of water produced with oil in the various wells, and from the rather slight fluid fill-up in the wells (averaging less than 50 feet), that the only drive mechanism in the reservoir is a very low-pressure water drive. This apparently accounts for the comparatively good recovery factor experienced in the field to date, but also precludes the drainage by any one well of more than a small radius from the well bore.

(2) Area Drained: on Appendix page A-2, an attempt has been made to estimate the area of the "450-foot" pay zone which has been

drained in the production of some 25,000 barrels of oil to date. If the assumed reservoir factors are approximately correct, a total of about 17½ acres has been more or less voided of oil. Based on known production data, an area of this size has been plotted on Exhibit D, to represent the apparently depleted portion of the reservoir. If the drained area is correctly plotted, it is apparent that structurally favorable areas are present outside the periphery of this area. Chaco Oil Company desires to drill four additional wells to the "450-foot" pay to tap the hitherto undrained portion of the reservoir.

(3) Projected Development: the locations of the four wells projected by Chaco Oil Company to more efficiently drain the reservoir are shown on Exhibit D. The tentative locations are based on two criteria: reported gauges of oil production in older wells which were never produced, and the assumed position of the depleted part of the reservoir in respect to known structure. Exhibit B shows reported amounts of oil gauged from older wells not now producing.

(4) Economic Need for Increased Production: since Chaco Oil Company was formed in November, 1957, its total income from sales of oil and gas from the Red Mountain field has been $5,189.39. In the same period, Chaco Oil Company's overhead and capital expenditures at Red Mountain have amounted to $19,855.16, leaving a deficit for approximately one year's operation of $14,665.77. Obviously, it will be necessary to increase production substantially if the deficit is to cease. From the Company's experience with the older,

depleted wells now on production, it is clear that production can only be increased by completing new wells outside the depleted portion of the field.

(5) No Increased Allowable Requested: as Exhibits B and D show, all of the past production has been from two forty-acre units, Number O in Section 20 and Number B in Section 29. Further, it appears that future production from any new wells will probably be confined to these same units. If Chaco Oil Company's application in this case is granted, the unit allowables set by the Oil Conservation Commission be almost certainly adequate for the productive capacity of the field, and at the same time permit the Company a reasonable return on its investment. Therefore, this application does not include a request for any increase over the standard two unit allowables.

SUMMARY

Chaco Oil Company is the assignee and operator of the Red Mountain oil field in McKinley County, New Mexico, and there is no production in the pool outside of the lease operated by Chaco Oil Company. Numerous wells have been drilled to the "450-foot" Mesaverde oil pay since the field discovery in 1934. Possibly eight wells have produced intermittently since 1934, and cumulative production is approximately 25,000 barrels to this date (November, 1958). At the present time, four wells have a total daily productive capacity of about nine barrels, from two forty-acre proration units.

The reservoir sand is a lentil or lenticular interval in the Menefee formation. In addition to an unknown amount of control by sand lenticularity, the pool is predominantly controlled by structure, viz., a dome or anticlinal nosing within a down-dropped fault block. Fairly good structural control obtained through a stratigraphic testing program, supplemented by previous subsurface mapping from sample logs, indicates that production to date has been largely from an area of about 17½ acres which lies somewhat down the flank of the structure northwest of the crest.

The reservoir drive mechanism apparently is a very low-pressure water drive. Solution-Gas is so slight as to be negligible. From observations of the producing wells, it seems likely that each well has a very modest drainage area, and that structurally-favorable portions of the reservoir can only be drained by drilling new wells.

Four new wells are projected in the Red Mountain pool, as shown on Exhibit D. All will fall within presently-productive proration units, and no increase in allowable is requested from the Commission.

The need for additional wells within the Red Mountain pool is sound from the point of view of engineering and conservation, and is an economic necessity, since present production is not sufficient to meet the expenses of operation.

Respectfully submitted,

Henry S. Birdseye
Co-Owner and Authorized Agent

19 November, 1958

Harry S. Birdseye
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Albuquerque, New Mexico

PRODUCTION SUMMARY, RED MOUNTAIN FIELD

McKINLEY COUNTY, NEW MEXICO

Barrels of Oil Produced

	1951	1952	1953	1954	1955	1956	1957	1958
January	unk.	213	119	210	60	0	0	175
February	"	77	0	80	135	0	0	200
March	"	308	494	162	135	0	0	250
April	"	297	0	140	195	0	0	225
May	"	306	180	115	195	0	0	125
June	"	231	156	180	165	0	0	125
July	"	153	200	225	0	0	0	100
August	"	231	0	195	0	0	314	50
September	"	0	222	75	0	0	376	95
October	"	201	128	75	0	0	287	170
November	"	0	180	0	0	0	300	
December	517	0	71	120	0	0	284	
TOTALS	517?	2017	1750	1577	885	0	1561	1515
CUMULATIVE	15985	18002	19752	21239	22214	22214	23775	25290

ASSUMED RESERVOIR DATA SHEET

RED MOUNTAIN OIL FIELD

McKinley County, New Mexico

"450-foot" Producing Sand (Menefee formation)

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Average Porosity	20 %
Average Connate Water Saturation	50 %
Original Reservoir Pressure	195 psi
Reservoir Temperature	70°F
Average Net Pay Thickness	8 feet
Average Recoverable Oil per Acre-foot	180 barrels
Average Recoverable Oil per Acre	1,440.7 "
Reservoir Volume Factor	1.05
Estimated Recovery Factor	25 %
Oil Produced to 11-1-58	25,290 barrels
Number of Reservoir Acres Voided	17.55 acres