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PETROLEUM EXPLORATION IN SOCORRO COUNTY

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Thirty-two petroleum test wells have been drilled in Socorro County since exploration began in 1923 (table 1, fig. 1). None of the 32 tests resulted in production. Eight wells have been drilled since the New Mexico Geological Society last published a list of Socorro County petroleum tests (New Mexico Geological Society, 1963). Drilling has been concentrated in three parts of Socorro County: the Acoma basin in the northwest part of the county, a north-trending band along the Rio Grande valley in the central part of the county, and a large anticline in eastern Socorro County. The general stratigraphy of Socorro County is outlined in Table 2.

None of the five wells drilled in the Acoma basin reported petroleum shows. Three of the wells (fig. 1, nos. 1, 3, 4; table 1, nos. 1, 3, 4) spudded in Triassic red beds and reached total depths ranging from 4,000 to 4,800 ft (1,200 to 1,500 m) in Precambrian basement. Although there is no production from the Acoma basin, potential reservoirs are present, chiefly as sandstones of the Mesaverde Group and Dakota Sandstone (Cretaceous), limestones and sandstones of the San Andres Limestone and Yeso Formation (Permian), and sandstones and limestones of the Magdalena Group (Pennsylvanian). Lower to middle Paleozoic rocks are not present in the Acoma basin and the Magdalena Group rests directly on Precambrian basement. Foster and Grant (1974) gave the Acoma basin a favorable exploration rating. Wengerd (1959) gave a favorable exploration rating to the Lucero region, which includes part of northwest Socorro County and part of the Acoma basin.

Seven exploration tests (fig. 1, nos. 6-8, 15-18; table 1, nos. 6-8, 15-18) have been drilled in the Rio Grande valley; all of these wells were drilled before 1942. All seven wells were spudded in Cenozoic valley-fill deposits and six of the wells apparently reached total depth in Tertiary rocks, probably the Santa Fe Group. One well, the Central New Mexico Oil Company No. 1 Brown-Livingston (fig. 1, no. 8; table 1, no. 8) may have penetrated the entire Tertiary section and reached total depth in Cretaceous rocks (Foster, 1978a, p. 237). Five wells reported oil shows, presumably in the Santa Fe Group; another well (fig. 1, no. 18; table 1, no. 18) reported a gas show in the Santa Fe. Major exploration targets in the Rio Grande valley of Socorro County are Tertiary, Permian, and Pennsylvanian rocks. Cretaceous rocks are not an exploration target because they are not present in most of the rift in Socorro County; the southwest, central, and north-central parts of the county were an emergent highland during the Late Cretaceous (Kottlowski, 1963, fig. 17; Cather, 1982, fig. 2) from which Cretaceous rocks were removed by erosion. Cretaceous sandstones are a major exploration target in the rift in Bernalillo and Valencia Counties, north of Socorro County (Black, 1982). Tertiary rocks are possible exploration targets because they have yielded several oil and gas shows in Socorro County and also to the north in Bernalillo and Valencia Counties (Black, 1982).

Wells 20-32 (fig. 1, table 1) were drilled on a large north-plunging anticline that forms the eastern boundary of the Jornada del Muerto. The anticline has been mapped as a surface structure and the Yeso Formation (Permian) is exposed along the axis of the anticline. The anticline appears to be a north-plunging limb of the faulted Oscura Mountains. Wells 20-32 were all spudded in the Yeso Formation (Permian) or in thin Quaternary sediments that overlie the Yeso. Only three wells drilled on the anticline reported petroleum shows (fig. 1, nos. 27, 28, 31; table 1, nos. 27, 28, 31). Six of the wells reportedly reached total depth in Precambrian basement, which is overlain nonconformably

by Pennsylvanian rocks in east-central Socorro County. On the anticline, limestones and sandstones of the Magdalena Group (Pennsylvanian) are probably the most favorable exploration targets. Other rocks that elsewhere contain petroleum reservoirs, the San Andres Limestone (Permian) and Cretaceous sandstones, have been removed by Cenozoic erosion. Reservoirs in the Yeso may be too shallow to contain petroleum accumulations.

Three wells were drilled in northeastern Socorro County by Richard B. Laing in the early 1950's (fig. 1, nos. 9, 10, 11; table 1, nos. 9, 10, 11). The three wells are located in the Estancia Basin, east of the Manzano Mountains. All were spudded in the Bursum Formation (Pennsylvanian-Permian) and reached total depth in the Magdalena Group (Pennsylvanian). The deepest well, the Richard B. Laing No. 1 Sanchez (fig. 1, no. 11; table 1, no. 11) reportedly had gas shows at depths of 836 ft (255 m) and 1,090 ft (332 m), probably from limestones or sandstones of the Madera Formation (Pennsylvanian). Foster and Grant (1974) gave a favorable exploration rating to parts of the Estancia Basin which are east of the Laing wells.

Only one well, the Skelly Oil Company No. 1 Goddard (fig. 1, no. 19; table 1, no. 19), has been drilled in the Socorro County portion of the Jornada del Muerto. It was spudded in the Yeso Formation (Permian) and was abandoned after reaching a total depth of 3,386 ft (1,032 m) in Precambrian quartzite. Potential reservoir rocks in the Jornada del Muerto are Cretaceous sandstones, the San Andres Limestone (Permian), sandstones, limestones and dolostones of the Yeso Formation (Permian), and sandstones and limestones of the Magdalena Group (Pennsylvanian). Structural traps may be lacking in the gentle syncline that forms the Jornada del Muerto. Foster and Grant (1974) gave a generally unfavorable exploration rating to the Socorro County portion of the Jornada del Muerto.

No petroleum exploration wells have been drilled in southwest Socorro County. The large volcanic cauldrons that cover much of the southwest part of the county (Chapin and others, 1978; Osburn and Chapin, this guidebook) make that area unfavorable for exploration. Also, southwest Socorro County was an erosional highland during the late Cretaceous (Kottlowski, 1963, fig. 17; Cather, 1982, fig. 2; this guidebook) and most Mesozoic and possibly some upper Paleozoic strata were removed by erosion. Lower to middle Paleozoic strata are also absent in most of southwest Socorro County. More than 2,000 ft (600 m) of Pennsylvanian strata are present in the San Mateo basin of southwest Socorro County (Kottlowski, 1963, fig. 9).

Pre-Mississippian rocks are preserved only in southernmost Socorro County. There, the Cambrian, Ordovician, Devonian, and Mississippian Systems pinch out northward as they are overlapped unconformably by Pennsylvanian rocks. The Cambrian, Ordovician, and Devonian Systems have an aggregate thickness of less than 300 ft (100 m) in southwest Socorro County and Silurian strata are absent (Kottlowski, 1963, figs. 3, 4, 5, 6, 7). Devonian rocks lack favorable reservoir characteristics. Oil could possibly be trapped in fault blocks or in updip pinchouts of Cambrian, Ordovician, and Mississippian sandstones, limestones, and dolostones.

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Table 1. Petroleum exploration wells in Socorro County, New Mexico. D & A = dry and abandoned.

Number on Fig. 1	Location (section-township-range)	Operator, well number and lease	Completion date (month/year)	Status	Total depth ft (m)	Rock unit at surface	Rock unit at total depth	Reported shows of oil and gas; additional comments
1	2-3N-8W	L. H. Mitchell & Sons No. 1 Red Lake	?/25	D & A	4,012 (1,223)	Triassic	granite (Precambrian)	
2	32-4N-6W	Ohio Oil Co. No. 1 McDonald State	11/26	D & A	1,997 (609)	Triassic		Completed as water well
3	27-4N-6W	Transocean Oil Co. No. 1 Major Santa Fe Pacific Railroad	7/77	D & A	4,690 (1,430)	Triassic	Precambrian	
4	17-4N-5W	Spanel & Heinz No. 1-9608 Santa Fe Pacific	8/59	D & A	4,784 (1,458)	Triassic	granite (Precambrian)	
5	32-4N-3W	White & Mangels No. 1 State	7/47	D & A	201 (61)	Permian	granite (Precambrian)	
6	23-4N-1E	Belen Oil Drilling Co. No. 1 Seipple	7/27	D & A	3,545 (1,081)	Santa Fe (Tertiary)		Oil show at 2,375 ft (724 m)
7	16-3N-1E	Joiner Oil Corp. No. 2 Livingston	10/41	D & A	845 (258)	Santa Fe (Tertiary)		Oil show at 845 ft (258 m)
8	16-3N-1E	Central New Mexico Oil Co. No. 1 Brown-Livingston	11/39	D & A	2,978 (908)	Santa Fe (Tertiary)	Cretaceous? (Foster, 1978a, p. 237)	Oil show at 1,860 ft (567 m)
9	23-2N-4E	Richard B. Laing No. 2 Sanchez	4/53	D & A	400 (122)	Bursum (Permian)	Pennsylvanian	
10	23-2N-4E	Richard B. Laing No. 2-A Sanchez	11/55	D & A	800 (244)	Bursum (Permian)	Pennsylvanian	
11	23-2N-4E	Richard B. Laing No. 1 Sanchez	4/52	D & A	1,182 (360)	Bursum (Permian)	Pennsylvanian	Gas shows at 836 ft (255 m) and 1,090 ft (332 m)
12	35-1N-6W	Transocean Oil Co. No. 1 Henderson Santa Fe Pacific Railroad	3/77	D & A	9,379 (2,859)	Mesaverde (Cretaceous)		
13	35-1N-6W	Whigham, Inc. No. 1 Santa Fe Pacific Davis-Pueblo	5/79	D & A	1,163 (354)	Mesaverde (Cretaceous)	Dakota (Cretaceous)	
14	35-2S-8W	Southland Royalties No. 1 Augustine	?/58	D & A	1,795 (547)	Quaternary	volcanics (Tertiary)	
15	13-1S-1E	Lajara Basin Oil Co. No. 1 Lajara	?/23	D & A	800 (244)	Quaternary		
16	30-5S-1E	New Mexico Development Co. No. 1 Perrin	3/28	D & A	3,275 (998)	Santa Fe (Tertiary)		Oil show at 1,387 ft (423 m)
17	13-6S-1W	Arnold et al. No. 1-A Apache	12/27	D & A	2,445 (745)	Quaternary	Permian	Oil show at 1,690 ft (515 m)
18	13-6S-1W	Arnold et al. No. 2 Apache	5/29	D & A	1,973 (601)	Quaternary	Permian	Gas show from 1,955–1,973 ft (596–601 m)
19	22-2S-4E	Skelly Oil Co. No. 1 Goddard	12/48	D & A	3,386 (1,032)	Quaternary	quartzite (Precambrian)	
20	23-2S-6E	Yates Petroleum Corp. No. 1 McCaw Federal	7/63	D & A	4,450 (1,356)	Yeso (Permian)	granite (Precambrian)	
21	14-3S-6E	Abo Oil Co. No. 1 Powell-Stackhouse	5/27	D & A	614 (187)	Yeso (Permian)	Permian	Completed as water well
22	14-3S-6E	Abo Oil Co. No. 1-A Powell-Stackhouse	?/31	D & A	750 (229)	Yeso (Permian)	Permian	
23	14-3S-6E	J. R. Lockhart No. 1 Powell-Stackhouse	9/30	D & A	2,772 (845)	Yeso (Permian)	Bursum? (Permian)	
24	14-3S-6E	Abo Oil Co. No. 1 Government Permit	12/27	D & A	584 (178)	Yeso (Permian)		
25	33-4S-6E	J. R. Lockhart No. 2 Lockhart	12/54	D & A	3,037 (926)	Yeso (Permian)		
26	22-4S-6E	Reeves Bros. Petroleum 'A' Ltd. No. 2 Morrison Federal	6/76	D & A	689 (210)	Yeso (Permian)	Permian	Completed as water well

Number on Fig. 1	Location (section-township-range)	Operator, well number and lease	Completion date (month/year)	Status	Total depth ft (m)	Rock unit at surface	Rock unit at total depth	Reported shows of oil and gas; additional comments
27	23-4S-6E	Virgle Landreth No. 1 Virgle Landreth Federal	2/73	D & A	3,445 (1,050)	Yeso (Permian)	Precambrian	Gas and condensate show from 2,499–2,505 ft (762–764 m); oil and gas show from 2,902–2,918 ft (885–889 m)
28	28-4S-6E	J. R. Lockhart No. 1 Lockhart Federal	11/53	D & A	2,990 (911)	Yeso (Permian)	granite (Precambrian)	Oil show from 1,120–1,125 ft (341–343 m)
29	22-4S-6E	Reeves Bros. Petroleum 'A' Ltd. No. 1 Morrison Federal	8/76	D & A	2,928 (892)	Yeso (Permian)	Pennsylvanian	
30	28-4S-6E	Virgle Landreth No. 1 Panhandle 'A'	8/73	D & A	3,240 (988)	Yeso (Permian)	Precambrian	
31	33-4S-6E	J. R. Lockhart No. 3 Lockhart	10/55	D & A	2,665 (812)	Yeso (Permian)	Precambrian	Oil show at 2,483 ft (757 m)
32	23-5S-5E	Sun Oil Co. No. 1 Bingham State	10/55	D & A	3,141 (957)	Quaternary	granite (Precambrian)	Completed as water well

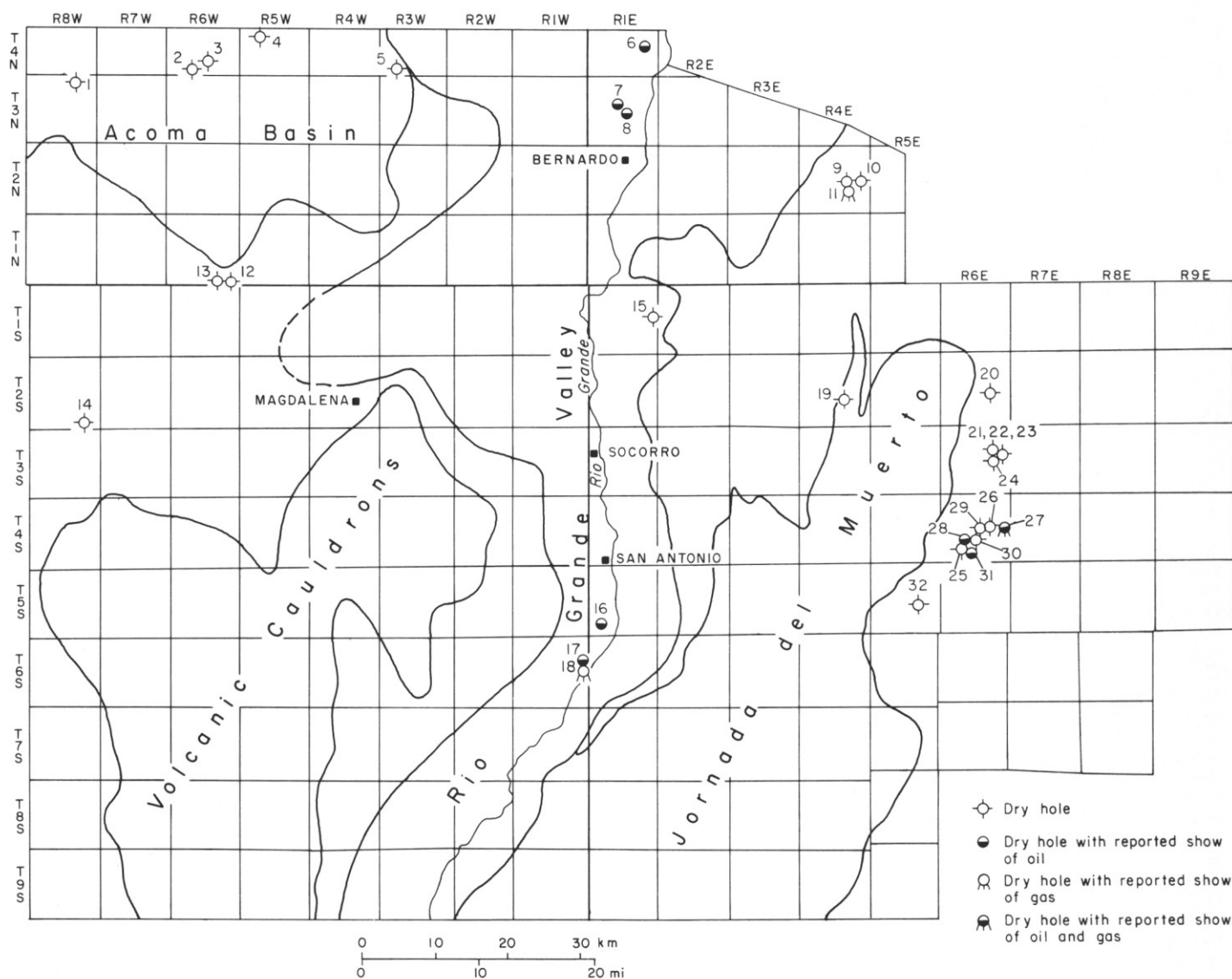


Figure 1. Petroleum exploration wells drilled in Socorro County. Geologic features are taken from Dane and Bachman (1965), Foster and Grant (1974), Osburn (this guidebook), and Woodward and others (1978).

Table 2. Estimated maximum thickness of geologic systems in the Socorro County parts of the Acoma basin, Rio Grande valley, and Jornada del Muerto. Data are from Armstrong (1962), Bachman (1968), Cape and others (1983), Foster (1978b), Kottowski (1959, 1963), Osburn and Chapin (1983), Smith and Budding (1959), Wengerd (1959), Wilpolt and Wanek (1952).

System	Group	Formation	Estimated Maximum Thickness, ft (m)		
			Acoma basin	Rio Grande valley	Jornada del Muerto
Tertiary	Santa Fe	Sierra Ladrones Fm.			
		Popotosa Fm.			
	Datil	Spears Fm.	0 (0)	13000 (4000)	160 (50)
		Baca Fm.			
Cretaceous		Mesaverde Fm.			
		Mancos Sh.	2000 (600)	3500 (1100)	2000 (600)
		Dakota Ss.			
Triassic	Dockum	Chinle Sh.	1200 (370)	500 (150)	600 (180)
		Santa Rosa Ss.			
Permian		San Andres Fm.			
		Glorieta Ss.			
		Yeso Fm.	2500 + (750 +)	3300 + (1000 +)	2700 + (800 +)
		Abo Fm.			
		Bursum Fm.			
Pennsylvanian	Magdalena	Madera Fm.	2700 (800)	2000 + (600 +)	2000 (600)
		Sandia Fm.			
Mississippian		Kelly Ls.			
		Lake Valley Ls./ Caloso Fm.	105 (32)	105 (32)	10 (3)
Devonian		undivided			
		Percha Sh. and equivalents	0 (0)	0 (0)	50 (15)
Ordovician		Montoya Do.			
		Cable Canyon Ss.	0 (0)	0 (0)	100 (30)
		El Paso Ls. ("Ellenburger")	0 (0)	0 (0)	100 (30)
Cambrian		Bliss Ss.	0 (0)	0 (0)	50 (15)

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