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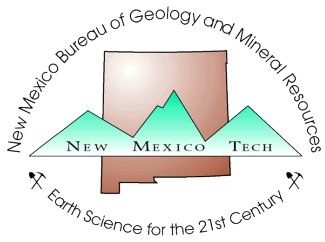

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Oil and gas activities in New Mexico in 1996

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Introduction

Drilling for oil and natural gas in New Mexico increased in 1996. A total of 1,308 wells were completed in 1996, an increase of 4% from the 1,261 wells completed in 1995. In the Permian Basin, southeast New Mexico, 999 wells were completed in 1996, up from 854 wells completed in 1995. In the San Juan Basin, northwest New Mexico, 424 wells were completed in 1996, up slightly from the 407 wells completed during 1995. In addition, 21 wells were drilled to develop carbon dioxide resources in the Bravo dome field of Union County.

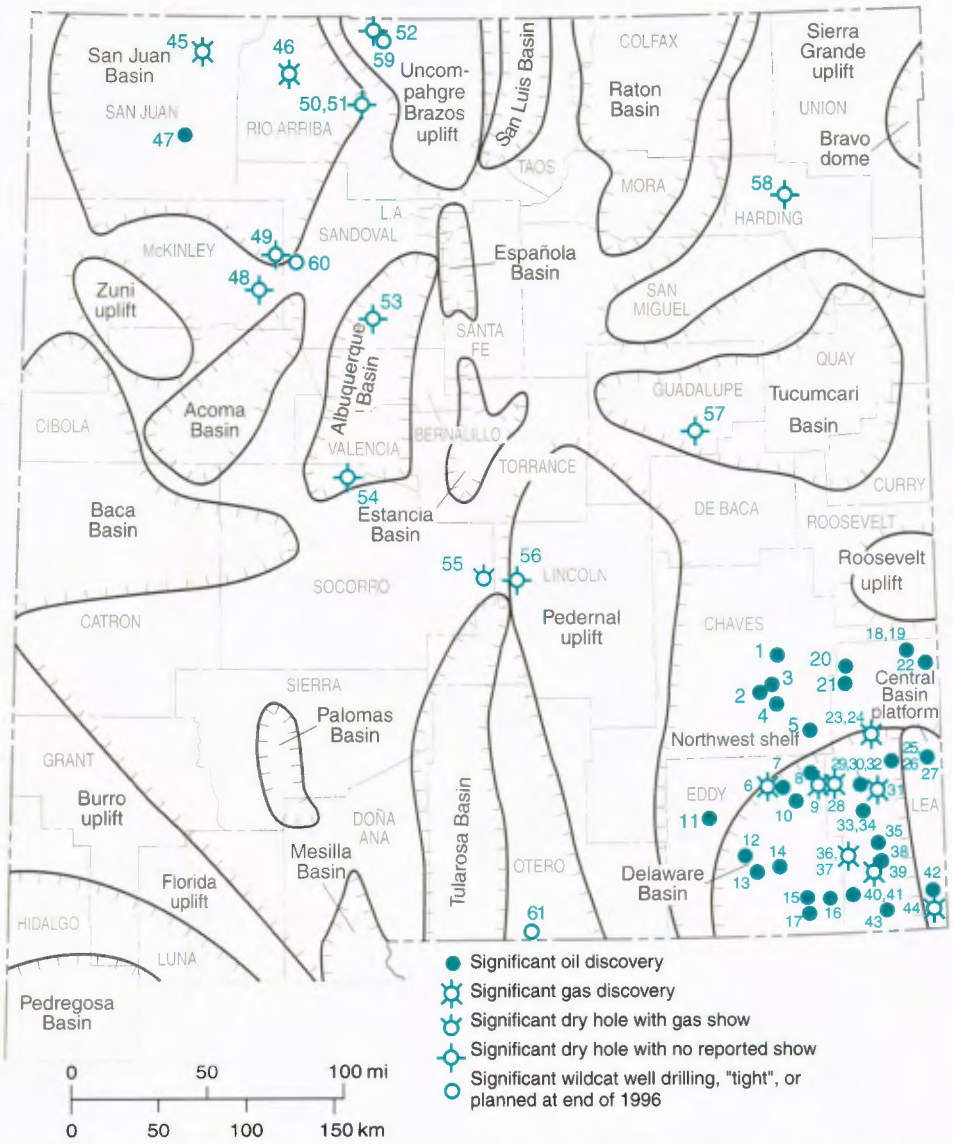

FIGURE 1—Significant oil and gas discoveries, dry holes, and frontier wildcat wells drilled in New Mexico in 1996. Major geologic features are from Broadhead and King (1988), Cather and Johnson (1984), Kelley (1978), Kottlowski and Stewart (1970), Meyer (1966), Molenaar (1977), Thompson and Jacka (1981), and Woodward et al. (1978).

During 1996, there was significant exploratory activity in the producing Permian and San Juan Basins. There was also significant exploratory activity in presently nonproductive frontier areas such as the Albuquerque–Belen Basin, the Tucumcari Basin, and in the Chupadera Basin of eastern Socorro and western Lincoln Counties. Rank wildcat wells were drilled in the Albuquerque–Belen, Tucumcari, and Chupadera Basins, and exploratory activities continued into 1997 in these areas.

The locations of significant exploratory wells completed in 1996 are shown in Fig. 1. Table 1 summarizes the significant exploratory discoveries, and Table 2 summarizes significant, but unsuccessful, exploratory wells. Table 3 lists significant exploratory wells that were being drilled at the end of 1996 or were scheduled to be drilled in 1997. Each well is designated by a number in parentheses that refers to its location in Fig. 1 and its description in Tables 1, 2, or 3.

Permian Basin, southeast New Mexico

Drilling activity increased in 1996 in the three geologic subdivisions of the Permian Basin: the Delaware Basin, the Central Basin platform, and the Northwest shelf; 999 wells were completed in this area in 1996, an increase of 17% from the 854 wells completed during 1995; 773 of these

Also in this issue

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Albuquerque Basin water studies

wells were completed as oil producers and 149 were completed as gas producers while 77 were dry and abandoned, resulting in a success rate of 92%. In addition, 29 other wells were drilled in southeast New Mexico in 1996; these other wells include injection wells for waterfloods and saltwater disposal wells. Drilling activity was concentrated in Permian reservoirs on the Northwest shelf and Central Basin platform and in the Delaware Basin.

Upper Guadalupian reservoirs

Shallow (2,000-4,000 ft) oil and associated gas reservoirs of the Yates and Queen Formations (Permian: Upper Guadalupian) were major targets of development drilling in 1996. Approximately 100 wells were completed in these zones. Drilling was primarily for development in mature fields on the Central Basin platform in Lea County. Activity was widespread, with significant numbers of development wells completed in Yates and Queen reservoirs in the Langlie–Mattix, Jalmat, and Eumont pools of Lea County.

San Andres and Grayburg reservoirs

Oil and associated gas reservoirs in the shallow (2,000-5,000 ft) San Andres and Grayburg Formations (Permian: lower Guadalupian) were primary targets of development drilling in 1996. Approximately 270 wells were completed in these zones. Drilling was primarily for development of mature fields on the southern part of the Northwest shelf in northern Eddy and Lea Counties. Activity was widespread with wells drilled in 26 different pools. Drilling was concentrated in the Grayburg–Jackson pool of Eddy County where 96 wells were drilled. Major development also took place in the Red Lake, Artesia, and Millman East pools of northern Eddy County and in the Maljamar and Vacuum pools of northern Lea County. Although exploration along the mature San Andres and Grayburg trends was limited, two significant discoveries were made. Production was established from the San Andres Formation in the Chi Operating No. 1 Oyster (34) in central Lea County, and oil was discovered in the Marbob Energy No. 1 Katie Elder State (2) in central Chaves County.

Delaware Mountain Group sandstones

Basinal sandstone reservoirs of the Delaware Mountain Group (Permian: Guadalupian) continued to be one of the most active plays in southeast New Mexico. During 1996, approximately 170 wells were drilled in search of oil in these reservoirs in the Delaware Basin. Depth to production typically ranges from 5,000 to 8,000 ft but can be as shallow as 2,000 ft in the northern part of the Delaware Basin.

Exploration was more active than in previous years, with 14 exploratory wells drilled. Development was mostly by infill drilling and conservative stepouts from known production; the development success rate of Delaware reservoirs exceeded 90% in 1996. Development wells were drilled in 46 oil pools. The Red Tank West, Avalon, Happy Valley, Ingle Wells, and Lea Northeast pools were the most intensely developed Delaware reservoirs in 1996. As in the past few years, most of drilling was for oil in the Brushy Canyon Formation, the lowermost of the three sandstone-bearing formations that constitute the Delaware.

Three significant discoveries of oil in the Delaware were made during 1996. Oil was discovered in Delaware sandstones in the Santa Fe Energy No. 1 Corral Fly Unit (17) in southeast Eddy County. Oil was also discovered in Delaware sandstones in the Santa Fe Energy No. 1 Turquoise 30 Federal (41) and in the Manzano Oil No. 1 Bobwhite SV Federal (33) along the eastern edge of the Delaware play in Lea County.

Bone Spring basinal sediments

Basinal allochthonous carbonates and sandstones of the moderately deep (6,00010,000 ft) Bone Spring Formation (Permian: Leonardian) were intensely drilled in 1996. Approximately 60 wells were drilled for oil in these reservoirs within the Delaware Basin. The Bone Spring play had been relatively inactive for the past few years as shallower targets in the Delaware Mountain Group were given preference for exploration and development drilling. Development wells were drilled in 22 oil pools in eastern Eddy and western Lea Counties. Drilling activity was most intense in the Red Tank pool of west-central Lea County. Eleven development oil wells were successfully completed in the Red Tank pool.

Exploration for hydrocarbons in Bone Spring reservoirs surged in 1994 and this exploratory activity continued into 1995 and 1996. In many cases, Bone Spring discoveries were made by reentering older wells that had produced from deeper reservoirs and had subsequently been abandoned in those deeper reservoirs. Along the western edge of the play, oil was found in the Bone Spring in two wells, the Penwell Energy No. 1 Rookie 7 State (12) and the Ray Westall No. 1 Riverbend (14). In the south-central part of the Bone Spring play, oil was found in the Penwell Energy No. 1 Ore Ida 14 Federal (15), the Bass Enterprises No. 123 Poker Lake Unit (16), and the Yates Petroleum No. 7 Haracz AMO Federal (40). Oil was discovered in the eastern part of the play in the Yates Petroleum No. 2 Alphabet Unit (35) and the BTA Oil Producers No. 1 Chiso C 8711 JV-P (38).

Yeso shelf sediments

Shallow shelf carbonate reservoirs of the Yeso Formation (Permian: Leonardian) were actively drilled in 1996. One hundred and twenty-six development wells were drilled in 28 pools on the Central Basin platform in southern Lea County. There was also some minor development of oil pools astride the shelf edge in southern Eddy County. Production is obtained from all four members of the Yeso (descending): Paddock, Blinebry, Tubb, and Drinkard members. In many of the pools, production from two or all three of these zones is commingled. In some pools, Yeso production is commingled with oil production from underlying Abo (Permian: Wolfcampian) carbonates. Pools with the most drilling activity in 1996 were the Blinebry pool, the Teague pool, and the Dollarhide pool of southeast Lea County.

There was limited exploration for hydrocarbons in Yeso reservoirs. One significant discovery was made. Oil was found

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in the upper Yeso in the Marbob Energy No. 1 Barnsdall Federal (7) on the southern margin of the Northwest shelf. This discovery is located along the northern margin of the Yeso play in areas where Yeso production is sparse.

Abo sandstone and carbonate reservoirs

Development of sandstone reservoirs in the Pecos Slope and Pecos Slope West gas pools continued slowly in 1996 with only 17 development wells completed in these "tight" gas reservoirs. There was only limited development of oil-bearing Abo shelf-margin carbonate reservoirs on the southern edge of the Northwest shelf and on the Central Basin platform with 32 wells drilled in nine reservoirs. Activity was concentrated in the Monument Abo pool of central Lea County where the 17 development wells were successfully completed. Two significant exploratory discoveries were made in the Abo carbonates in southeastern Lea County (42, 44).

Wolfcamp carbonates

Moderately deep (9,000-11,000 ft) carbonate reservoirs in the Wolfcamp Group (Permian: Wolfcampian) were developed at a limited rate in 1996. Twelve development oil wells and nine development gas wells were completed successfully in 14 pools in northern and central Eddy County and in southern and central Lea Counties. However, exploration for Wolfcamp hydrocarbons was vigorous and four significant exploratory discoveries were made during 1996. In Eddy County, oil was discovered in the Wolfcamp in the Texaco No. 3 DD 24 Federal (11) and in the Penroc Oil No. 1 PFI Amoco 19 Federal (13). Oil was discovered in the Wolfcamp in Lea County in the Manzano Oil No. 1 SV Chipshot (26) and in the Enron No. 1 Jamaica Olson Federal (43).

Upper Pennsylvanian carbonates

Moderately deep (7,000-10,000 ft) Cisco and Canyon (Upper Pennsylvanian) carbonate reservoirs continued to be developed aggressively in 1996. Seventy-two development wells were successfully completed in nine reservoirs. Activity was concentrated in the Dagger Draw North pool where 27 development oil wells were successfully completed and in the Dagger Draw South pool where 22 development oil wells and one gas well were successfully completed. Fifteen development wells were completed in the Indian Basin gas pool that lies just southwest on the Dagger Draw oil pools and forms the gas cap to those pools. The Dagger Draw North and Dagger Draw South pools are examples of underdeveloped reservoirs that produced minor volumes of oil for almost 20 years. Upon realization that substantial oil resources remained unproduced in these reservoirs, drilling programs were instituted to tap into those resources. The result was an immediate increase in production, and Dagger Draw North and Dagger Draw South quickly became two of the most productive oil pools in southeast New Mexico. In 1995, they produced 8 million bbls oil, approximately 14% of the state's total oil production. There were five significant exploratory discoveries in Upper Pennsylvanian carbonates during 1996 (5, 8, 20, 21, 30).

Strawn reservoirs

Development of moderately deep (10,000-12,000 ft) Strawn (Middle Pennsylvanian) reservoirs continued in 1996. Development of existing reservoirs was slow, with only 13 development wells successfully completed in 12 pools. Exploration for oil and gas in Strawn carbonate reservoirs was also subdued. Only one discovery was made. Oil was discovered in Strawn carbonates in the Chesapeake Operating No. 1 Chambers 7 (25). Initial potential was an impressive 482 bbls oil per day and 800 thousand ft^3 gas per day from 10 ft of pay.

Atoka and Morrow "deep gas" reservoirs

The deep (10,000-14,000 ft) gas reservoirs in the Atoka and Morrow Groups saw limited development with only 37 development wells completed successfully in 28 pools in 1996. Exploratory drilling was also subdued, but several discoveries were made. Exploration was for gas in Morrow reservoirs (wells 6, 31, 37, and 39) and also for oil in the shallower Atoka reservoirs (wells 23, 29, 32, and 36). Although the Atoka produces gas throughout most of southeast New Mexico, an oil play of modest size has emerged in the Atoka during the past few years in northeast Lea County.

Devonian, Silurian, and Ordovician reservoirs

Exploration for oil in seismically defined structural traps in the lower Paleozoic section was strong on the Central Basin platform and on the Northwest shelf. Many traps in the lower Paleozoic are formed by fault-bounded anticlinal closures. Three exploratory wells were drilled successfully on the Northwest shelf in Chaves County (wells 1, 3, 4). Five additional exploratory discoveries were made in Lea County (wells 18, 19, 22, 27, 28). Exploration for structural traps in the Devonian, Silurian, and Ordovician sections is expected to remain strong through 1997. Better definition of the relatively small structures that form traps in the lower Paleozoic has been made possible recently by new and affordable 3-D seismic techniques, although this new technology has not yet been fully utilized to define such factors as seal integrity or migration pathways. These latter factors are apparently important when considering entrapment of hydrocarbons in the lower Paleozoic section on the Northwest shelf.

San Juan Basin, northwest New Mexico

Drilling activity increased slightly during 1996 in the San Juan Basin. There were 424 completions during the year, an increase of 4% from the 407 completions in 1995. The success rate was 95%, with 381 wells completed as gas producers, 22 wells completed as oil producers, and 21 wells plugged and abandoned. Drilling concentrated on development of gas reservoirs in the Fruitland coals (Cretaceous), Pictured Cliffs and other Mesaverde sandstones (Cretaceous), and Dakota sandstones (Cretaceous).

Fruitland coalbed methane reservoirs

Gas reservoirs of the Fruitland Formation (Upper Cretaceous) continued to be aggressively developed in 1996, but at a decreased rate from previous years. Approximately 60 wells were completed in the Fruitland. Most of these wells were drilled in coalbed methane reservoirs of the giant Basin pool in eastern San Juan County.

Pictured Cliffs Sandstone

Gas reservoirs in the Pictured Cliffs Sandstone (Upper Cretaceous) were major targets for exploratory and development drilling in 1996. More than 60 wells were completed in these reservoirs. Development drilling was concentrated in the Kutz West and Fulcher Kutz pools of northeast San Juan County. Exploration for gas in Pictured Cliffs sandstones was subdued in 1996 with most exploratory drilling concentrated on developing and extending previously discovered gas.

Mesaverde sandstones

Development of gas reservoirs in Mesaverde sandstones (Upper Cretaceous) remained strong during 1996. Approximately 150 development gas wells were completed in Mesaverde sandstones. Almost all of these wells were completed in the Blanco pool of northeast San Juan and northwest Rio Arriba Counties. Many of these wells were completed as dual producers from gas reservoirs in Mesaverde sandstones and in Dakota sandstones.

Exploration for gas in the Mesaverde was minimal in 1996. In the southern part of the San Juan Basin, the High Plains Petroleum No. 1 Red Dog Federal (49) was

TABLE 1—Significant wildcat discoveries in New Mexico in 1996; the term formation is used in an informal sense. **BOPD**, bbls oil per day; **MCFGPD**, thousand ft³ gas per day; **BCPD**, bbls condensate per day; **BWPD**, bbls water per day; **IPP**, initial potential pumping; **IPF**, initial potential flowing; **IPS**, initial potential from swabbing; **IP**, initial potential; **owwo**, old well worked over.

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Completion date (mo/yr)	Total depth (ft)	Formation at total depth	Producing formation	Producing interval (ft)	Initial potential	Oil gravity (degrees API)
1	30-9S-28E, Chaves	Marbob Energy No. 1 McClintock Fee	11/96	6,977	Devonian	Devonian	6,785-6,977	IPP 42 BOPD + 167 BWPD	
2	36-11S-27E, Chaves	Marbob Energy No. 1 Katie Elder State	11/96	7,737	Precambrian	San Andres (Permian)	2,664-2,666	IPP 41 BOPD + 51 BWPD	
3	3-11S-28E, Chaves	Marbob Energy No. 1 True Grit Fee	8/96	7,092	Devonian	Devonian	7,030-7,092	IPF 194 BOPD + 25 MCFGPD	
4	33-12S-28E, Chaves	Marbob Energy No. 1 Ramos Fee	9/96	8,200	Devonian	Devonian	8,169-8,184	IPP 42 BOPD	
5	16-14S-30E, Chaves	Manzano Oil No. 1 Vest SV State	1/96	10,757	Devonian	Upper Pennsylvanian	8,316-8,338	IPF 152 BOPD + 150 MCFGPD	
6	32-17S-28E, Eddy	Arco Permian No. 1 Dancer 32 State	6/96	10,610	Mississippian	Morrow (Pennsylvanian)	10,200-10,206	IPF 896 MCFGPD + 13 BCPD	
7	27-17S-29E, Eddy	Marbob Energy No. 1 Barnsdall Federal	10/96	5,766	Yeso (Permian)	Yeso (Permian)	4,008-4,318	IPP 40 BOPD + 110 MCFGPD + 621 BWPD	
8	6-17S-31E, Eddy	Burns Operating No. 1 Arco 6 Federal	3/96	12,250	Devonian	Canyon (Pennsylvanian)	9,424-9,464	IPF 115 BOPD + 107 MCFGPD	42
9	28-17S-31E, Eddy	Texaco No. 1 Dow B28 Federal	5/96	12,725	Mississippian	Mississippian	12,118-12,180	IPF 250 MCFGPD + 24 BCPD	46
10	7-18S-30E, Eddy	Enron Oil & Gas No. 1 Sand Tank Federal	5/96	11,835	Mississippian	Mississippian	11,673-11,693	IPF 150 BOPD + 3452 MCFGPD + 9 BWPD	
11	24-19S-24E, Eddy	Texaco No. 3 DD 24 Federal (owwo)	4/96	8,000	Canyon (Pennsylvanian)	Wolfcamp (Permian)	6,218-6,542	IPP 41 BOPD + 192 MCFGPD + 293 BWPD	44
12	7-22S-26E, Eddy	Penwell Energy No. 1 Rookie 7 State (owwo)	3/96	11,600	Barnett (Mississippian)	Bone Spring (Permian)	6,715-6,843	IPP 30 BOPD + 20 MCFGPD + 105 BWPD	36
13	19-22S-26E, Eddy	Penroc Oil No. 1 PFI Amoco 19 Federal (owwo)	7/96	11,390	Morrow (Pennsylvanian)	Wolfcamp (Permian)	9,254-9,262	IPF 8 BOPD + 195 MCFGPD	
14	25-22S-27E, Eddy	Ray Westall No. 1 Riverbend	8/96	7,950	Bone Spring (Permian)	Bone Spring (Permian)	7,674-7,764	IPP 5 BOPD + 20 MCFGPD + 50 BWPD	
15	14-24S-29E, Eddy	Penwell Energy No. 1 Ore Ida 14 Federal	6/96	8,122	Bone Spring (Permian)	Bone Spring (Permian)	7,764-7,946	IPF 213 BOPD + 289 MCFGPD + 140 BWPD	47
16	22-24S-31E, Eddy	Bass Enterprises No. 123 Poker Lake Unit	4/96	15,240	Morrow (Pennsylvanian)	Bone Spring (Permian)	11,586-11,600	IPP 10 BOPD + 251 BWPD	
17	2-25S-29E, Eddy	Santa Fe Energy No. 1 Corral Fly Unit	2/96	14,002	Morrow (Pennsylvanian)	Delaware (Permian)	5,341-5,366	IPP 76 BOPD + 37 MCFGPD + 171 BWPD	38
18	1-9S-36E, Lea	Layton Enterprises No. 1 El Zorro H Federal	1/96	12,360	Devonian	Devonian	12,340-12,360	IPF 196 BOPD	45
19	9-9S-36E, Lea	Cobra Oil & Gas No. 1 Alecshire 9	2/96	12,988	Devonian	Devonian	12,935-12,986	IPF 90 BOPD	48
20	12-10S-32E, Lea	Manzano Oil No. 1 Jordan State	10/96	9,250	Cisco (Pennsylvanian)	Cisco (Pennsylvanian)	8,833-8,857	IPF 200 BOPD + 200 MCFGPD	51
21	7-11S-33E, Lea	Elk Oil No. 1 RR State (owwo)	5/96	10,450	Strawn (Pennsylvanian)	Upper Pennsylvanian	10,081-10,373	IPF 45 BOPD + 45 MCFGPD + 200 BWPD	42
22	5-10S-38E, Lea	Cobra Oil & Gas No. 5 Bronco Farms 5 Federal	11/96	11,918	Devonian	Devonian	11,873-11,918	IPF 164 BOPD	41
23	34-14S-34E, Lea	Yates Petroleum No. 1 Papalotes Unit	6/96	13,660	Mississippian (Pennsylvanian)	Atoka	12,634-12,654	IPF 1400 MCFGPD	

TABLE 1—continued

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Completion date (mo/yr)	Total depth (ft)	Formation at total depth	Producing formation	Producing interval (ft)	Initial potential	Oil gravity (degrees API)
24	5-15S-35E, Lea	Yates Petroleum No. 1 Morton Unit	7/96	13,593	Mississippian	Mississippian	13,407-13,426	IPF 1020 MCFGPD	
25	7-16S-36E, Lea	Chesapeake Operating No. 1 Chambers 7	11/96	12,047	Lower Pennsylvanian	Strawn (Pennsylvanian)	11,458-11,468	IPF 482 BOPD + 800 MCFGPD	
26	11-16S-36E, Lea	Manzano Oil No. 1 SV Chipshot	9/96	11,954	Atoka (Pennsylvanian)	Wolfcamp (Permian)	10,578-10,590	IPF 253 BOPD + 363 MCFGPD	
27	1-16S-38E, Lea	Browning Oil No. 1 Knowles	10/96	13,053	Silurian	Silurian	12,955-13,053	IPP 138 BOPD + 8 BWPD	46
28	20-17S-32E, Lea	Conoco No. 1 Elvis	12/96	13,900	Devonian	Devonian	13,771-13,774	IPF 674 BCP + 847 MCFGPD + 432 BWPD	52
29	36-17S-34E, Lea	Texaco No. 1 New Mexico O State NCT-1	1/96	11,500	Atoka (Pennsylvanian)	Atoka (Pennsylvanian)	11,120-11,226	IPF 430 BOPD + 1001 MCFGPD	43
30	15-17S-35E, Lea	Primero Operating No. 1 Shoe Bar State (owwo)	7/96	12,248	Atoka (Pennsylvanian)	Canyon (Pennsylvanian)	10,989-11,035	IPF 16 BOPD + 169 MCFGPD	37
31	30-17S-35E, Lea	Shell No. 1 State Ridge B	6/96	11,740	Morrow (Pennsylvanian)	Morrow (Pennsylvanian)	11,518-11,532	IPF 1205 MCFGPD + 35 BCPD	50
32	1-18S-34E, Lea	Texaco No. 18 New Mexico L State	6/96	11,500	Atoka (Pennsylvanian)	Atoka (Pennsylvanian)	11,092-11,110	IPF 558 BOPD + 1263 MCFGPD + 22 BWPD	47
33	4-19S-34E, Lea	Manzano Oil No. 1 Bobwhite SV Federal	2/96	14,578	Devonian	Delaware (Permian)	7,809-7,819	IPP 43 BOPD + 37 MCFGPD + 65 BWPD	
34	22-19S-35E, Lea	Chi Operating No. 1 Oyster	11/96	6,475	Delaware (Permian)	San Andres (Permian)	5,420-5,535	IPP 15 BOPD + 15 MCFGPD + 29 BWPD	
35	17-21S-34E, Lea	Yates Petroleum No. 2 Alphabet Unit (owwo)	12/96	14,303	Morrow (Pennsylvanian)	Bone Spring (Permian)	9,239-9,249	IPP 45 BOPD + 123 MCFGPD + 10 BWPD	
36	6-22S-32E, Lea	Kaiser-Francis Oil No. 1 Federal CK (owwo)	8/96	15,018	Barnett (Mississippian)	Atoka (Pennsylvanian)	13,630-13,648	IPF 3806 MCFGPD	
37	34-22S-32E, Lea	Pogo Producing No. 1 Red Tank 34 Federal (owwo)	10/96	15,300	Morrow (Pennsylvanian)	Morrow (Pennsylvanian)	14,760-14,786	IPF 675 MCFGPD	
38	23-22S-34E, Lea	BTA Oil Producers No. 1 Chiso C 8711 JV-P (owwo)	3/96	13,350	Morrow (Pennsylvanian)	Bone Spring (Permian)	9,324-9,396	IPS 3 BOPD + 23 BWPD	42
39	29-22S-34E, Lea	Santa Fe Energy No. 1 Gaucho Unit	10/96	15,100	Devonian	Morrow (Pennsylvanian)	12,955-13,358	IPF 2110 MCFGPD + 2 BCPD	52
40	19-24S-32E, Lea	Yates Petroleum No. 7 Haracz AMO Federal	5/96	9,900	Bone Spring (Permian)	Bone Spring (Permian)	8,593-9,752	IPP 70 BOPD + 85 MCFGPD + 298 BWPD	
41	30-24S-32E, Lea	Santa Fe Energy No. 1 Turquoise 30 Federal	9/96	8,754	Bone Spring (Permian)	Delaware (Permian)	7,254-7,278	IPP 66 BOPD + 44 MCFGPD + 185 BWPD	38
42	23-24S-37E, Lea	Arch Petroleum No. 4 Plains Knight	1/96	6,500	Abo (Permian)	Abo) (Permian)	6,274-6,387	IPF 91 BOPD + 173 MCFGPD	42
43	35-25S-34E, Lea	Enron Oil & Gas No. 1 Jamaica Olsen Federal (owwo)	11/96	15,997	Morrow (Pennsylvanian)	Wolfcamp (Permian)	13,345-14,044	IPF 18 BOPD + 29 MCFGPD + 17 BWPD	38
44	25-25S-37E, Lea	Arco Permian No. 1 Wimberly IDA	8/96	6,700	Abo (Permian)	Abo (Permian)	6,154-6,535	IPF 854 MCFGPD + 1 BWPD	
45	23-30N-10W, San Juan	Meridian Oil No. 5 Riddle B	4/96	7,408	Dakota (Cretaceous)	Gallup (Cretaceous)	6,327-6,582	gas, IP not reported	
46	20-29N-4W, Rio Arriba	Falcon-Seaboard No. 1 29-4 Carson 20	4/96	3,610	Pictured Cliffs (Cretaceous)	Nacimiento (Tertiary)	1,721-2,142	IPP 324 MCFPD + 116 BWPD	
47	27-23N-11W, San Juan	Dugan Production No. 1 Hop Sing	10/96	4,115	Gallup (Cretaceous)	Gallup (Cretaceous)	3,779-3,965	oil, IP not reported	

TABLE 2— Significant wildcat dry holes in New Mexico in 1996; the term formation is used in an informal sense. **D&A**, dry and abandoned; **J&A**, junked and abandoned; **DST**, drill-stem test; **rec**, recovered; **perf**, perforated; **frac**, fractured.

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Completion date (mo/yr)	Total depth (ft)	Formation at total depth	Status	Comments
48	16-15N-6W, McKinley	Merrion Oil & Gas No. 1 Sarcio	3/96	3,552	Wingate (Jurassic)	D&A	DST 3285-3353 ft (Entrada), rec water
49	10-17N-5W, McKinley	High Plains Petroleum No. 1 Red Dog Federal	1/96	1,154	Mancos (Cretaceous)	D&A	Drilled to test Mesaverde (Cretaceous)
50	11-27N-1E, Rio Arriba	A L Dawsey No. 1 El Vado	2/96	1,579	Dakota (Cretaceous)	D&A	Perf & frac 1,097-1,105 ft (Mancos), swabbed oil & gas-cut load water
51	11-27N-1E, Rio Arriba	A L Dawsey No. 2 El Vado	2/96	1,340	Dakota (Cretaceous)	D&A	No reported shows
52	30-32N-2E, Rio Arriba	Thompson Engineering No. 1 Gonzales	8/96	2,606	Entrada (Cretaceous)	D&A	No reported shows
53	3-13N-2E, Sandoval	Davis Petroleum No. 1-Y Tamara	1/96	8,732	Chinle (Triassic)	D&A	Drilled to test Cretaceous; no reported shows.
54	19-4N-1E, Socorro	Davis Petroleum No. 1 Angel Eyes	3/96	8,074	Santa Fe (Tertiary)	D&A	Drilled to test Cretaceous. No reported shows. Did not reach objective.
55	8-4S-9E, Socorro	Manzano Oil No. 1 Cathead Mesa	11/96	6,190	Precambrian	D&A	Excellent gas show in lower part of hole.
56	9-4S-11E, Lincoln	Manzano Oil No. 1 Spaid Buckle	11/96	4,871	Precambrian	D&A	No reported shows.
57	1-6N-22E, Guadalupe	Labrador Oil No. 1 Mescalero	12/96	14,597	Precambrian	J&A	Scheduled to drill to 18,000 ft. Lost drill pipe, collars, and bit below 9,000 ft. Bridge plug set at 6,190 ft.
58	35-21N-29E, Harding	Amoco No. 1 Bueyeros	6/96	5,378	Precambrian	D&A	Drilled to test Tubb (Permian) and Precambrian for CO_2. Top Precambrian at 2,834 ft.

TABLE 3—Significant wildcat wells being drilled or scheduled to be drilled at the end of 1996.

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Comments
59	24-31N-2E, Rio Arriba	E F Durkee No. 4 Garcia Ranch	Drilled to total depth of 1,010 ft in Morrison Fm (Jurassic). Temporarily abandoned. Further completion will be attempted in 1997.
60	17-17N-4W, Sandoval	High Plains Petroleum No. 1 B Hermana Federal	Scheduled to drill to 2,750 ft to test Mancos Shale (Cretaceous).
61	14-26S-12E, Otero	Harvey E. Yates No. 1 Bennett Ranch	Scheduled to drill to 6,400 ft to El Paso Fm (Ordovician).

drilled to a total depth of 1,154 ft to test Mesaverde sandstones, but production was not established.

Gallup sandstone

Oil reservoirs in the Gallup sandstone (Upper Cretaceous) saw mild development activity during 1996. Eleven development wells were completed successfully in seven reservoirs and an additional five development wells were plugged and abandoned. Activity was scattered among the Bisti, Bisti South, Devils Fork, Lybrook, Angel Peak, Cha Cha, Verde, and Horseshoe pools. Two significant exploratory discoveries were made. Oil was discovered in the Gallup in the Dugan Production No. 1 Hop Sing well (47). Gas was discovered in the Gallup in the Meridian Oil No. 5 Riddle B well (45).

Dakota sandstones

Oil and gas reservoirs in sandstones of the Dakota Group (Upper Cretaceous) were developed aggressively in 1996. Five oil wells and 97 gas wells were completed in Dakota reservoirs. Drilling for gas was concentrated in the giant Basin pool of northeast San Juan and west Rio Arriba Counties. Oil drilling was concentrated in the Lindrith West pool of southeast Sandoval County. In many wells, production from the Dakota is commingled with production from Mesaverde, Gallup, and Graneros sandstones (Upper Cretaceous).

Entrada Sandstone

There was significant exploration for hydrocarbons in the Entrada Sandstone (Jurassic) in northwest New Mexico during 1996. In the southern part of the San Juan Basin, the Merrion Oil and Gas No. 1 Sarcio (48) was drilled to a total depth of 3,552 ft to test the Entrada. The well was abandoned after water was recovered on a drill-stem test of the Entrada. On the eastern flank of the San Juan Basin, the Thompson Engineering No. 1 Gonzales (52) was abandoned at a total depth of 2,606 ft in the Entrada without establishing production.

Horizontal wells were successfully drilled in the Papers Wash pool of northeast McKinley County, the Snake Eyes pool of southeast San Juan County, and the Media and Eagle Mesa pools of northwest Sandoval County. These wells were completed in the uppermost part of the Entrada and presumably are designed to minimize water coning and reduce the amount of water produced from each well. Vertical Entrada wells typically pro-

duce high volumes of water after just two or three years of production; production becomes uneconomic in some of these wells because of the high cost of pumping the oil and water and the high cost of water disposal.

Pennsylvanian carbonates

Development of hydrocarbons in Pennsylvanian carbonate reservoirs was moderate during 1996. Four development gas wells were successfully completed in the Barker Creek field of northwest San Juan County. Although modest production of oil and gas is obtained from Pennsylvanian reservoirs on the western flank of the San Juan Basin, the Pennsylvanian section has been tested by relatively few wells throughout most of the basin and remains a promising exploratory target. Both Burlington Resources and Conoco have ongoing exploratory programs targeted at Pennsylvanian reservoirs.

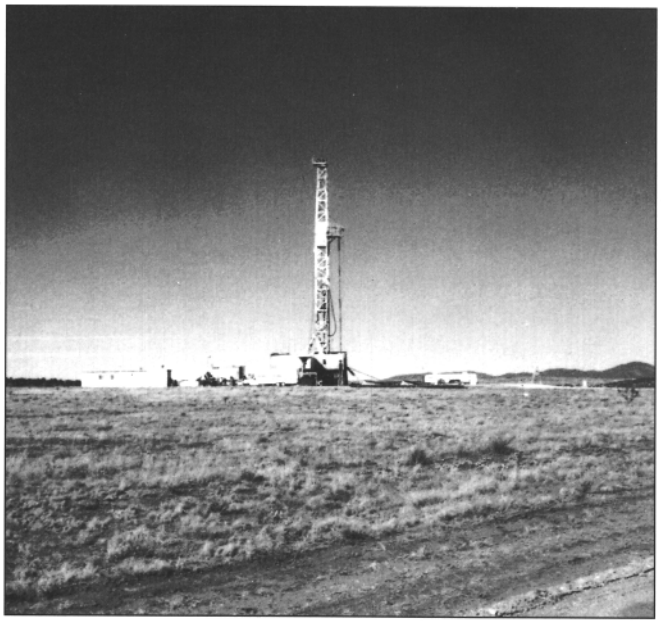

FIGURE 2—Manzano Oil No. 1 Cathead Mesa well being drilled in eastern Socorro County, October 1996.

Albuquerque Basin

In central New Mexico, Davis Oil Corp. and Vastar Resources discontinued exploratory efforts in the Albuquerque–Belen Basin. These exploratory efforts have resulted in drilling two wells with Davis Oil as the operator. The Davis No. 1-Y Tamara (53) was spudded in late 1995 in the northern part of the basin. It was drilled to a total depth of 8,732 ft in the Chinle Formation (Triassic) and was abandoned in 1996 without reported shows. The Davis Oil No. 1 Angel Eyes (54) was spudded in the southern part of the basin in early 1996 and abandoned at a total depth of 8,074 ft in sands of the Santa Fe Group. The well was not drilled to a sufficient depth to penetrate Upper Cretaceous sandstones, the primary exploratory objectives in the basin. Twining Oil Company has continued to acquire leases in the southern part of the basin.

Exploratory interest in the Albuquerque Basin has been intermittent. The last exploration was in the early 1980s when Shell and UTEX Oil Company drilled eight wildcat wells in the basin in search of hydrocarbons in the Cretaceous section. Although production was not established in those wells, significant shows of gas were found, and analyses of drilling indicate that the necessary parameters for commercial production are present within the basin. Black (1982, 1989) has summarized the petroleum geology and the history of oil and gas exploration in the Albuquerque Basin.

Northeast New Mexico

Northeast New Mexico saw significant exploratory activity and plans for significant development in 1996. A petroleum exploration well was completed in the Tucumcari Basin. Plans were made for further development of carbon dioxide resources in the Bravo dome. In addition, plans were considered to develop and produce coalbed methane in the Raton Basin.

In the Tucumcari Basin, the Labrador Oil Company No. 1 Mescalero (57) was drilled to a total depth of 14,597 ft in Precambrian rocks. The well had been scheduled to drill to a total depth of 18,000 ft, but drilling ceased after the drill collars and drill pipe were lost in the hole below 9,000 ft. There was also extensive leasing of acreage in the basin by Circle Energy and Rio Grande Resources during 1996. It is expected that drilling will follow that leasing activity. Commercial production of hydrocarbons has not been obtained from the Tucumcari Basin, but marginally commercial discoveries of both oil and gas were made in the early 1980s (Broadhead and King, 1988); these discoveries were never exploited. Primary objectives in the basin are Pennsylvanian sandstones and limestones and Lower Permian dolostones.

Pennzoil was reported to still be considering a program to develop and produce coalbed methane in the Vermejo Formation (Cretaceous) in the Raton Basin. From 1989 through 1991, Pennzoil drilled more than 30 wells as part of a pilot program to test and evaluate coalbed methane in the basin. Primary use of the gas, if developed and produced, will be to generate electricity at a proposed power-generating plant in the city of Springer.

Elsewhere in northeast New Mexico, Amoco continued development of the Bravo dome carbon dioxide gas field of Union County. Amoco drilled 20 new wells to enhance production. In Harding County, northwest of the Bravo dome field, the Amoco No. 1 Bueyeros (58) was drilled to a total depth of 5,378 ft in Precambrian rocks in search of additional carbon dioxide resources, but production was not established. Almost all carbon dioxide produced from the Bravo dome field is transported through pipelines tothe Permian Basin where it is used in enhanced oil recovery. Currently, most of the enhanced-recovery projects are in the Texas part of the basin (Oil and Gas Journal, 1996). Some carbon dioxide is converted to dry ice and bottled, liquid carbon dioxide at small processing facilities in Union and Harding Counties.

In northernmost Union County, federal lands near the Colorado State Line have been leased. Although the objectives of this lease play are not known, they may involve Morrow sandstones (Lower Pennsylvanian) that produce oil in southeast Colorado.

Southwest New Mexico

Two petroleum exploration wells were drilled in southwest New Mexico during 1996 in the Chupadera Basin of eastern Socorro and northwestern Lincoln Counties. The Manzano Oil No. 1 Cathead Mesa well (55; Fig. 2) was abandoned at a total depth of 6,190 ft. The gas detector on the mudlogging unit recorded an excellent gas show in the lower part of the hole. The Manzano Oil No. 1 Spaid Buckle well (56) was abandoned at a total depth of 4,871 ft with no reported shows.

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