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Oil and Gas Developments in North Mid-Continent in 1989¹

Shirley E. Paul,² Bruce W. Netzler,³ Raymond R. Burchett,⁴ Paul H. Roberts,⁵ Roger Peters,⁶
Donivan L. Gordon,⁷ and John H. Mossler⁸

ABSTRACT

In 1989, drilling in Kansas fell to a new low of 2560 wells, down 21.5% from 1988. The overall success rate was 55.20%. The total footage drilled was 7,666,299 ft, for an average of 2995 ft/well. In 1989, Kansas operators reported 42 new fields: 30 oil and 7 gas. Several new fields were abandoned before the year ended.

In Nebraska, the total value of oil and gas increased to \$119 million in 1989. Exploration continued to focus on western and southwestern Nebraska during 1989. New discoveries were found in Banner, Hayes, Kimball, and Lincoln Counties.

INTRODUCTION

This report summarizes 1989 petroleum exploration and development activity in the north Mid-Continent, AAPG Committee on Statistics of Drilling District 12, which includes Iowa, Kansas (Figure 1), Missouri (Figure 2), and Nebraska (Figure 3). Wisconsin and Minnesota had no drilling to report.

IOWA

Iowa had little activity in 1989. In the southeastern area of the state in Washington and Keokuk Counties, Earth Reference Systems drilled 4 shallow tests. Information on these tests has not been released.

KANSAS

In 1989, Kansas drilling activity declined to another low with completions off 21.5% from 1988 figures. New

discoveries declined from 94 fields in 1988 to 47 new fields in 1989. Some discoveries were abandoned before year end. Seventy percent of 1989 discoveries were made in western Kansas, and 14% on the Central Kansas uplift. The remaining counties in the state had a total of 6 discoveries.

The percentage of new discoveries in each reservoir was Pennsylvanian, 66%; Mississippian, 32%; and Ordovician, 2%.

During 1989, 3444 wells were plugged, considerably more than the 2661 wells plugged in 1988. Producing oil wells declined from 45,867 at the beginning of 1989 to an estimated 44,716 wells at the close of the year. Gas wells fared better than the oil wells due to the infield drilling in the Hugoton gas area. At the beginning of 1989, there were 13,316 producing gas wells in the state; of these, 256 gas wells were plugged during the year. New gas wells drilled during 1989 totaled 397, which brought the total number to 13,457 gas wells.

Production

Oil production dropped again for the fifth consecutive year, declining to 56,290,628 BOPD (Table 2). Part of the decline might be attributable to the large number of stripper wells that were becoming too expensive to operate. However, natural gas production was 593,456,325 mcf, up from 1988 due to the new infield wells producing in the Hugoton gas area.

Western Kansas

Nineteen Eighty-Nine was the third year of infield drilling in the Hugoton gas area. The 225 gas wells completed in 1989 were 38.5% fewer than the previous year's 366 gas wells. Gas production from the field has increased substantially (30.9%) since the beginning of infield drilling in 1986.

An estimated 447 deep exploratory tests were drilled in the 9 counties of the Hugoton gas area. The leading counties in number of deep tests were Grant (106), Stevens (88), and Morton (57). Morton has been a very active county and has produced more oil (60.4 million bbl) than any other county in the Hugoton gas area.

Kinsler East field (Table 3, no. 1) is located 2.5 mi east of Kinsler field. Development drilling began immediately, and 10 additional wells were completed in the Morrow. The discovery well produced 168 BOPD and 827 MCFGD from the Morrow. Other potentials ranged from 116 BOPD and 34 MCFGD to 245 BOPD and 380 MCFGD. Several

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Table 1. New York Production, 1989*

| County | Field | Amount | BOPD |
|--------------------|--------------------------|----------------|------------------------|
| Oil (bbl) | | | |
| Allegany & Steuben | Allegany | 67,271 | 185 |
| Cattaraugus | North Ext. Bradford | 316,108 | 866 |
| Chautauqua | Akron Trend and Busti | <u>111,391</u> | <u>305</u> |
| Total | | 494,770 | 1,356 |
| Gas (mmcf) | | | |
| | | 25,477 | <u>MCFGD</u> 69,800 |

*Data from Division of Mineral Resources of New York State Department of Environmental Conservation.

Table 2. New York Exploratory Tests, 1989

| Map No. (Fig. 1). | County and Town | Operator, Well No., and Lease | Compl. Date | Total Depth (ft) | Formation at TD | Producing Formation | Explor. Class | Remarks |
|-------------------|------------------------|-------------------------------|-------------|------------------|-----------------|---------------------|---------------|----------------------------|
| 1 | Allegany, Ward | Cabot 1 Greenburg | 1989 | 4,094 | Salina Gp. | — | NFW | Dry |
| 2 | Cattaraugus, Ashford | Fault Line 1 Williams | 1989 | 3,600 | Queenston | Medina | OP | SW Ext., 1 Borer (1988) |
| 3 | Cattaraugus, Yorkshire | Pioneer Central Sch. 1 Fee | 1989 | 3,508 | Queenston | Medina | OP | S Ext., Arcade |
| 4 | Delaware, Franklin | Cabot 1A Grant | 1989 | 5,580 | Lorraine | — | NFW | Dry |
| 5 | Tioga, Nichols | Quaker State 2 Owen | 1989 | 5,295 | Salina Gp. | — | OP | Dry, Stagecoach |

wells were reported as "oil well." One Morrow gas well had an initial production of 2100 MCFGD and 8 BWPD.

The McCoy Petroleum 1-24 Lahey (Table 3, no. 2) was drilled between Cutter field and Cutter South field in Sec. 24, T31S, R35W. The discovery well was completed in the St. Louis for an initial production of 342 BOPD and 78 MCFGD from the Morrow. An extension well drilled by McCoy Petroleum in Sec. 23 was completed as an oil well in the Mississippian.

Elsewhere in Stevens County, the Mobil Oil 5 Phillips in Sec. 17, T31S, R35W flowed 5000 MCFGD from the Morrow. The completion added a new pay zone to Cave West field.

Will-Bros field, drilled in November 1988 (Table 3, no. 3), had 4 new development wells drilled in Sec. 4 and Sec. 5, T31S, R40W. Three wells were completed as oil wells in Sec. 4. An extension in Sec. 5 had a flowing initial production of 248 BOPD, 1358 MCFGD, and no water from the Morrow. The field was extended into Stanton County by a shut-in gas well in Sec. 33, T30S, R40W. Cumulative production on January 1, 1990, was 252,398 bbl of oil.

Big Bow field straddles the Stanton-Grant county line. The discovery well was the Arco Oil & Gas 1 Plummer (Table 3, no. 4), which was completed for oil in the St. Louis. An extension well in Sec. 26, T29S, R39W, the 1 Gaidarsi was drilled by Arco for an initial production of 355 BOPD from 5698 to 5708 ft. Another well in sec. 25 made 318 BOPD from the St. Louis from 5653 to 5663 ft. The field had a cumulative recovery of 498,249 bbl of oil by year end.

Three development wells were added to Beauchamp Southwest field in Sec. 3 and Sec. 4, T31S, R41W. Two wells in Sec. 4 had initial potentials of 120 BOPD plus 250 MCFGD and 90 BOPD plus 40 MCFGD. A third development well was completed as an "oil well" in Sec. 3.

In Kearny County, Brandt Production drilled about 1 mi northwest of Orange J field and completed a well (Table 3, no. 5) in the St. Louis for 160 BOPD and 2 BWPD. The field was named Orange J Northwest field. Several months later, Brandt Production reworked the well and completed the producing zone in the Morrow. The well then flowed 174 BOPD and 12 BWPD from 4953 to 4970 ft. The McCoy 1-14 Campbell Trust in Sec. 14 had an initial production of 215 BOPD. By year end, the field had made 48,280 bbl of oil.

Stewart field in Finney County continued to be extended westward. Nine new oil wells (1 Mississippian and 8 Morrow) brought the total producers to 46 wells. The field is located within 0.25 mi of the east edge of the Hugoton gas area. As of the close of 1989, the field had produced 1,486,329 bbl of oil.

The Chief Drilling 1 Daniels (Table 3, no. 6) is located 0.75 mi from the Buerkle field in northern Finney County and the southern line of Scott County. Production of 100 BOPD is from the Morrow. No development has taken place.

In Hamilton County, 5 deep tests were drilled to the Mississippian scattered throughout the Bradshaw gas area. Four of the 5 wells were completed in the Chase, the fifth was a dry hole.

In Grant County, an extension was added to Hick field. C. M. Becker completed 2 wells in Sec. 27: the 1 Christian was completed for 118 BOPD and 18 MCFGD, the 1

Waters was completed for 84 BOPD and 24 BWPD. Both were perforated in the Chester and are located in the western part of Sec. 27, T30S, R35W.

In Seward County, information on Angman field, which was completed in November 1988, was held confidential until 1989. The discovery well was the Anadarko Production H-1 Morgan (Table 3, no. 7) in Sec. 5, T32S, R33W. The nearest field is Silverman field, about 2 mi east of the well. The initial potential was released as 1.79 MMCFGD (no water) from the Chester (Mississippian).

Elsewhere, Ensign Operating added 3 new wells to Thirty-one Southwest field in Sec. 24, Sec. 26, and Sec. 27, T31S, R32W. The 2-24 Coval Trust was completed for a flowing initial production of 1081 MCFGD, water free, from the Morrow. Another well was completed for gas and oil in the Morrow, and the third was a Morrow gas well (no potential released).

Haskell County had an unusual number of deep extensions and new pay zones in various fields. Among these fields is Kisner South field in Sec. 1, T27S, R33W, discovered in 1987. In 1989, 4 development wells and several new pay zones were added to the field. The Berexco 1 Leona, in Sec. 1, T27S, R33W, added Marmaton oil, and another well added Morrow oil. Berexco discovered Lemon East field. The discovery well (Table 3, no. 8) was completed in the Marmaton. An extension was drilled in Sec. 31, T29S, R32W and completed in the Marmaton.

Southwest of the town of Manning in Scott County, Slawson Exploration had a Lansing-Kansas City and Marmaton discovery well (Table 3, no. 9) that found Manning Townsite Southwest field. The confirmation well was completed in another new pay zone, the Pleasanton, southwest of the discovery, which had been drilled in Sec. 27, T17S, R31W.

Slawson Exploration drilled a deep test (Table 3, no. 10) in the Hugoton Northeast gas area in Scott County and completed the test for 140 BOPD and 3 BWPD from the Pleasanton. The field was named Buerkle North.

In 1989, about 24 exploratory wells were drilled within the 10-mi area from Arapahokan field (in Sec. 36, T15S, R42W) south to Stockholm Southwest field (T16S, R42W and T16S, R43W) along the Kansas-Colorado state line. Companies drilling in the area were focusing their attention on finding Morrow oil or gas in channel sands. This has been a highly significant play. Morrow wells in Stockholm South field have been completed with initial potentials as high as 190 BOPD and 50 MCFGD. Five wells in Stockholm Southwest field (e.g., Table 3, no. 11) have reported potentials of 320 BOPD and 80 MCFGD to 190 BOPD and 50 MCFGD (pumping). One well (Table 3, no. 12) in Arapahokan field had a pumping initial potential of 243 BOPD. At year end, about 22 wells were being drilled in the area.

Another important exploratory development is taking place on the Las Animas arch across the state line in Colorado. It appears very possible that this play may also extend into Cheyenne County, Kansas. Several wells are being drilled in northwestern Wallace County.

Dolomite Resources' 26.1 Barns Estate, in Sec. 26, T31S, R35W, Stanton County, extended Cutter South field 0.5 mi east. The well flowed 399.6 BOPD, no water, from the basal Chester sand. Currently, the well is producing at the field-allowable rate of 135 BOPD.

A discovery well (Table 3, no. 13), in Sec. 6, T16S, R21W in the northeast part of Ness County, was completed for 120 BOPD from the second sand of the Cherokee. The same operator drilled a second well 0.5 mi northwest. It was completed for 56 BOPD and 23 BWPD from the same sand.

Source Petroleum worked over a 1986 dry hole (Table 3, no. 14) about 3 mi northeast of the city of Ashland in Sec. 29, T32S, R22W, Clark County. The Lansing-Kansas City formations were perforated from 4494 to 4699 ft, yielding a flowing initial production of 1400 MCFGD. The field was named Blaricum field.

Re-issued information was released on the 3 Arbuckle wells in Red Cliff field in Sec. 13, T33S, R24W, southern Clark County. The discovery well (completed in 1987) was reported perforated in the Arbuckle from 6770 to 6788 ft. The top of the Arbuckle was 6767 ft (4754 ft subsea) and the gravity of the oil was 42.5°. The total depth was 6840 ft. Many zones were drill-stem tested. The well (Table 3, no. 15) was completed for 90 BOPD, no water. The second well was also drilled in Sec. 13. The Viola and Arbuckle were perforated between 6836 and 6852 ft and completed for a flowing initial production of 30 BOPD and 70 BWPD.

Roberts & Murphy 1-2 Box Ranch (Table 3, no. 16), Sec. 2, T35S, R20W, discovered oil in the Mississippi and Viola formations. The new field was named Box Ranch field and is located in the southwest township of Comanche County. There were 6 wells by the end of 1989. Two dry holes were drilled in Sec. 2, T35S, R20W. Box Ranch field has made 168,751 bbl of oil.

Coon Creek North field was discovered in 1987 in Sec. 36, T25S, R21W. Since then, 5 wells have extended the field north and south and have produced 129,681 bbl of oil from the Lansing-Kansas City, Cherokee, and Mississippian. One-and-a-quarter miles north, oil was discovered in a well (Table 3, no. 17), in Sec. 23, T25S, R21W, in the Cherokee. One mile northeast in Sec. 24, T25S, R21W, Hinkle Oil discovered oil from the Mississippian and found Fored Northwest field (Table 3, no. 18).

Much drilling took place in Gove County. Numerous new pays and extensions to fields were found as well as several discoveries. Castle Resources discovered new Marmaton pay within Leighton field. Two new oil fields were the Atlantus South in Sec. 13, T15S, R27W, for an unknown amount of oil from the Marmaton formation, and Teler Townsite West, which produced 35 BOPD from the Lansing-Kansas City formation.

Two new Lansing-Kansas City discoveries were made in Thomas County. Both appear to be on a northwest-southeast trend. Ostmeyer field is located at the southeast end in Sec. 32, T9S, R31W. The discovery well (Table 3, no. 19) was drilled by Morrison-Dixon Oil Operators and was completed for 85 BOPD and no water. At the northwest end of the trend in OHL Northwest field is the Brito Oil 1-21 Renner (Table 3, no. 20), in Sec. 21, T9S, R32W, which was completed for 150 BOPD and 3.8 BWPD. Between these 2 new fields are several other small fields.

Central Kansas Uplift

During 1989, the Central Kansas uplift area had 545 new wells drilled or 20.46% of the wells drilled in Kansas.

Seven discoveries were made and, among the older fields, there were some important extensions.

Cooper field is located in T10S, R21W. Six Arbuckle wells were drilled in 1989 with potentials from 75 BOPD to 112 BOPD. Eleven oil wells were added to Marcotte field in T10S, R16W. Two new Lansing-Kansas City wells were added to Westhusin field in Sec. 12, T9S, R17W. The S & M Oil 8 Baxa in Sec. 12 found 12 pay zones between 3071 and 3378 ft that recovered 90 BOPD and 90 BWPD from the Lansing-Kansas City. The 9 Baxa produced 135 BOPD and 10 BWPD from the Lansing-Kansas City in the same section.

A discovery was made by Ritchie Exploration 1 Wyrill-19B (Table 3, no. 21), in Sec. 19, T6S, R20W, in the Lansing-Kansas City-Marmaton. From April through December 1989, this well made 3359 BOPD. The well is located about 0.5 mi south of Todd Northwest field.

Kemper field in Sec. 1, T6S, R23W, Graham County, was discovered in November 1988. The confirmation well, Kemper 2, was completed in April 1989. The 2 wells in the field have produced 21,595 bbl of oil.

Roland Southeast field was discovered in June 1988 and produces oil from both the Lansing-Kansas City and the Arbuckle in Secs. 25, 35, and 36, T16S, R20W. The field has produced 84,584 bbl of oil. Adjacent to Roland Southeast field is Hampton North field. One well in Sec. 36, T16S, R20W was completed for 88 BOPD from the Arbuckle.

Two large wells were drilled by Conoco in the northern part of Stead South field in Pratt County. The Conoco 9 prospect, in Sec. 35, T26S, R12W, topped the Mississippian at 4140 ft. The well was fractured and flowed 250 BOPD, 104 BWPD, and 100 MCFGD. Conoco drilled a second test, the 8 Studer, in Sec. 35. This well pumped 106 BOPD, 45 BWPD, and 160 MCFGD.

Sedgwick Basin

Only 1 discovery was made in Barber County in 1989: the discovery well (Table 3, no. 23) of Groendyke Southwest field in Sec. 3, T34S, R12W. The field is located about 0.75 mi southwest of Groendyke field and 1.5 mi northeast of Boggs Southwest field. No drilling has taken place in the immediate area since the discovery.

Six extensions have been added to the Aetna gas area in the southwestern area of Barber County.

Two development wells in Lerado field (Secs. 10 and 15, T26S, R9W) were completed in the Viola. The pumping initial production of one was 120 BOPD and 32 MCFGD, and the other had an initial production of 45 BOPD and 15 BWPD from the Viola.

Salina Basin

H & H Producing drilled a wildcat in Osborne County approximately 16 mi east of production on the Central Kansas uplift in the Salina basin. The field is located in Sec. 11, T10S, R12W in Osborne County, and was named Sigle field. The discovery well was completed in Lans-

ing-Kansas City for 25 BOPD and 2 BWPD. The confirmation well was completed in the same section for 7 BOPD and 6 BWPD. Shields Oil drilled a test in Sec. 10 and got 20 BOPD and 5 BWPD. From June to December 1989, the 2 wells produced 6302 bbl of oil.

In Lincoln County, Charlie Kosarek drilled a test in Sec. 12, T11S, R9W, about 18 mi north of Wilson Creek field. The test was drilled to a total depth of 4080 ft in the Reagan and was a dry hole.

East of Lost Springs field in Chase County is the Davis gas field, which was drilled in 1929 and later in the 1940s. The field covered most of the southeast quarter of T18S, R8W. Recently, the field has spread into Secs. 13, 14, 23, 24, 25, and 36, T18S, R7E. Twenty-eight new gas wells were drilled in 1988 and 1989. Most of the wells averaged about 50 MCFGD, but several wells averaged about 200 MCFGD.

Eastern Kansas

Almost the same number of wells were drilled in eastern Kansas and western Kansas during 1989, but in western Kansas there were a large number of exploratory wells and in eastern Kansas the number of development wells was very large. For example, 40 development wells were added to the Humboldt/Chanute field. Anderson County added 49 new oil wells to 4 fields. Leavenworth had 35 new producers. Blue Mound South field in Linn County had 42 oil wells. In Johnson County, there were 51 oil and gas development wells.

There was 1 gas discovery well in Sec. 36, T9S, R21E, in Leavenworth County. The D & D Inc. 1 Barnhardt was completed in the McLouth sand.

MISSOURI

Permitting decreased from 79 wells in 1988 to only 21 wells in 1989. Production also decreased from 156,358 bbl of oil in 1988 to 134,739 bbl of oil in 1989. Things are not looking too great for Missouri these days.

Cherokee Basin

All production in Missouri's portion of the Cherokee basin comes from the heavy-oil-bearing lower Cherokee Group Pennsylvanian sandstones 100-200 ft below the surface in Vernon County. At present, 1 field produces some oil, although it has not fired up its steam generators for several years because of low oil prices. Hopefully, this will soon change. There has been some interest of late in acquiring leases in this basin.

Forest City Basin

The only active areas in the Forest City basin are Atchison and Holt Counties in the northwest corner of Missouri. Tarkio field generated a little excitement in 1988. Stone Petroleum encountered oil in a well that

was located 2 step-outs southeast of Tarkio field (Pennsylvanian). Although, this well produced oil on test, it has had multiple completion problems. Again in 1988, several exploratory wells were drilled in this 2-county area looking for Ordovician-Devonian or Pennsylvanian pays. Most of these wells were drilled to Precambrian and, unfortunately, all were noncommercial (Table 4, nos. 1-7).

Lincoln Fold

Two wells were drilled in 1989 by Earth Reference Systems in Knox and Schuyler Counties. Both were dry (Table 4, nos. 8, 9).

Mississippi Embayment

No wells were drilled in the embayment in 1989.

NEBRASKA

The decline in domestic drilling was reflected by Nebraska's level of activity during 1989. However, the total value of oil and gas produced in Nebraska increased from \$89 million in 1988 to \$119 million in 1989. In 1989, 1687 wells produced 6,231,544 bbl of oil and 593 mmcf of casinghead gas. Approximately 285 mmcf of dry gas were produced from 15 wells, and 10 gas wells were shut in (Table 5). Of the 107 wells drilled for oil and gas during 1989, 59 were for exploration and 48 for development. In addition another 11 were classified as facility wells (Table 7). The largest number of exploration and development wells completed occurred in Hayes County, followed by Kimball, Hitchcock, Cheyenne, Red Willow, and Banner Counties.

The 107 wells drilling in 1989 represent a decrease of 28 from the total of 135 wells drilled during 1988. In 1989, a total of 59 exploratory wells was drilled, a decrease of 24 from the 83 wells drilled during 1988 (Table 2). The success rate for exploratory wells during 1989 was 24%, about the same as 1988. A total of 48 development wells was drilled, a decrease of 4 wells from the 52 drilled during 1988. The success rate for development wells was 67% compared to 48% for 1988. The decline in drilling from 1984 through 1989 has been dramatic: in 1985, 307 wells were drilled; in 1986, 144 wells; in 1987, 210 wells; in 1988, 135 wells; and in 1989, 107 wells.

Denver-Julesburg Basin

Oil and gas production in the Denver-Julesburg basin is produced from the Cretaceous (Dakota) "D" and "J" sands, with the "J" being the larger oil producer. New deeper discoveries have resulted in oil production from the Pennsylvanian Missourian and Virgilian limestones, dolomites, and sandstones. There is also production from the lower part of the Permian Wolfcamp dolomite and dolomitic limestones.

Southwestern-Central Nebraska Area

Production of oil in the southwestern and central part of the state is from several zones (listed from oldest to youngest): Cambrian "Granite Wash", Cambrian "Reagan" sandstone, Pennsylvanian Cherokee sandstone, Pennsylvanian "Basal Sand", Pennsylvanian Lansing-Kansas City limestones, Pennsylvanian Douglas sandstone, Pennsylvanian Oread limestone, Pennsylvanian Topeka limestone, Pennsylvanian Wabaunsee limestone, and Permian Foraker limestones.

Forest City Basin

Oil production in the Nebraska portion of the Forest City basin is mainly from the Devonian "Hunton" dolomite and limestone. Production also continues from the Ordovician Viola dolomite and the Ordovician "St. Peter" sandstone.

1989 Highlights

Exploration highlights during 1989 include the discovery of 4 new oil fields in western and southwestern

Nebraska: 1 in Banner County, 1 in Hayes County, and 1 each in Kimball and Lincoln Counties (Figure 3).

In Banner County, Prenalta completed the 44-9 Knab discovery well in Sec. 9, T19N, R56W to open Willow Creek field. The well initially pumped 11 BOPD and 8 BWPD from the Cretaceous "J" sand between 5850 and 5852 ft.

In Hayes County, CNG Producing completed the 1 Gathman discovery well in Sec. 28, T8N, R34W to open Prospect field. The well initially pumped 5 BOPD from the Pennsylvanian Cherokee sand between 4650 and 4652 ft.

In Kimball County, Exxon completed the 1 Linn-Terrestrial discovery well in Sec. 29, T15N, R56W to open Terrestrial field. Completion data are not available.

In Lincoln County, Hummon completed the 2 Strawder/Kloves discovery well in Sec. 21, T10N, R33W to open Sunbird field. Completion oil well data is not available.

Also, during 1989, Amoco sold all of its working interest production in Nebraska to Beard Oil, Floyd Oil, and Triad Energy for approximately \$10 million. Beard acquired a 25% interest and will operate the properties, with Floyd owning 50% and Triad 25%. The purchase included 96 wells producing 1200 BOPD and 83 water injection and saltwater disposal wells.

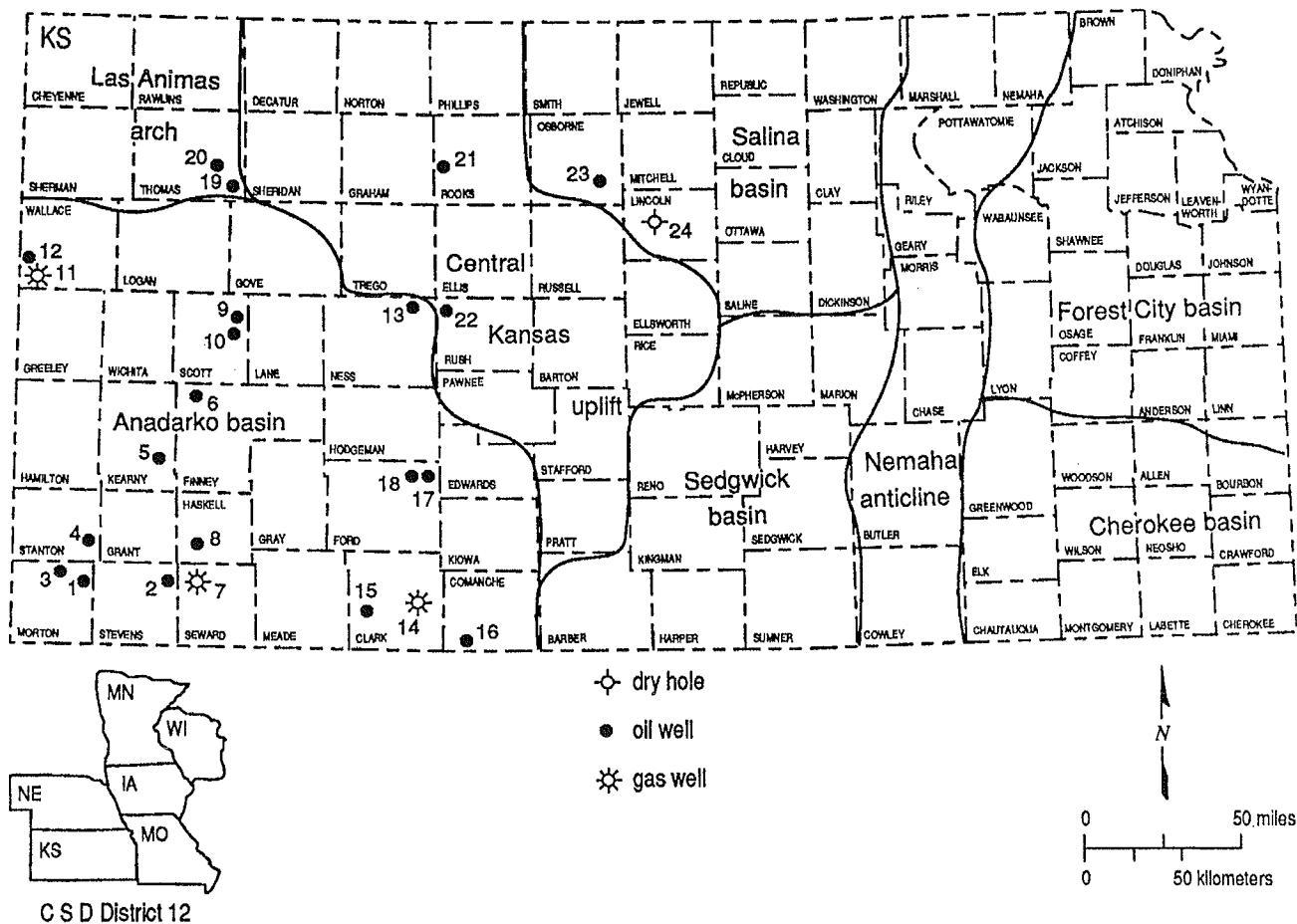


Figure 1—Kansas important wells, 1989. Numbers refer to wells listed in Table 3.

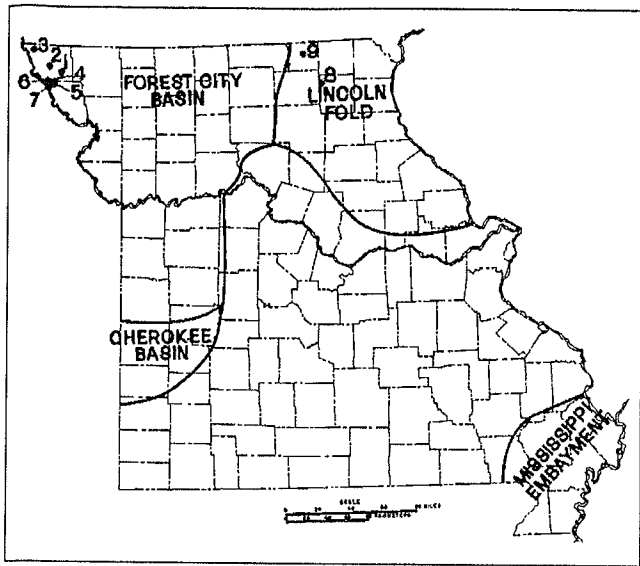


Figure 2—Missouri important wells, 1989. Numbers refer to wells listed in Table 4.

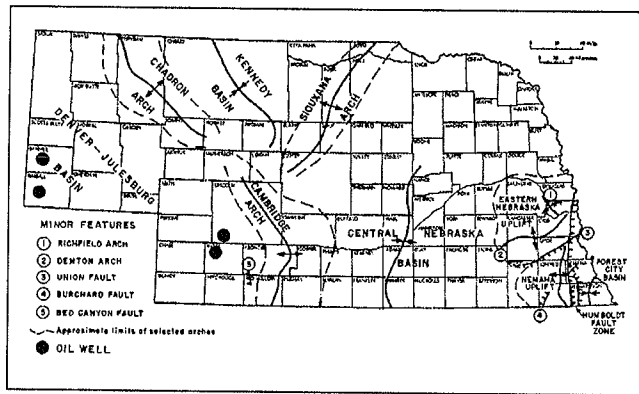


Figure 3—Nebraska new oil discoveries, 1989.

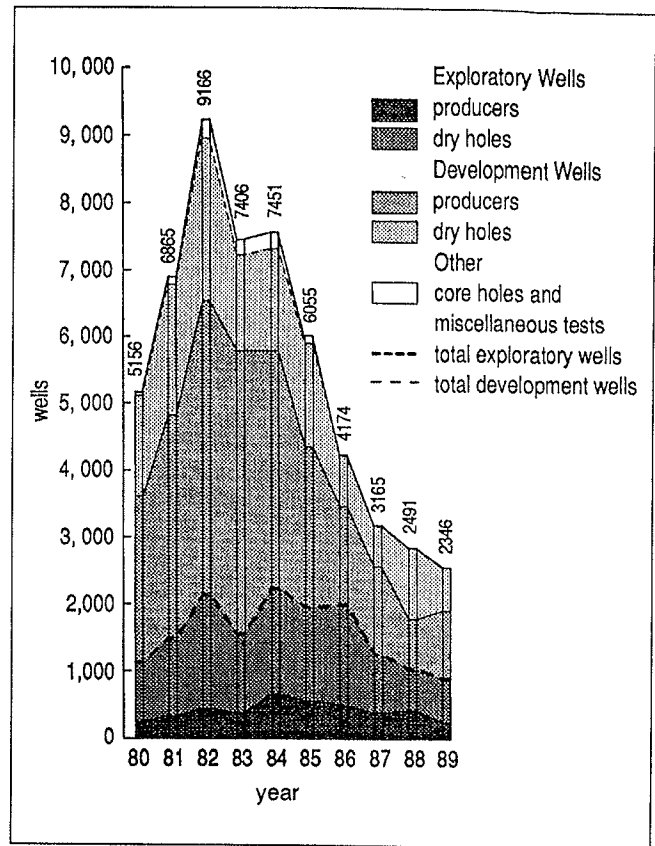


Figure 4—Kansas exploratory and development drilling, 1980-1989.

Table 1. North Mid-Continent Exploratory and Development Drilling, 1989

| | Successful | Dry | Total | Success (%) | Footage for All Wells |
|-------------------|------------|-----------|-----------|-------------|-----------------------|
| Exploratory Wells | | | | | |
| Kansas | 218 | 647 | 865 | 25.20 | 3,492,049 |
| Missouri | 0 | 8 | 8 | 0.00 | 25,591 |
| Nebraska | <u>14</u> | <u>45</u> | <u>59</u> | 23.73 | <u>295,953</u> |
| Total | 232 | 700 | 932 | 24.89 | 3,813,593 |
| Development Tests | | | | | |
| Kansas | 1,195 | 496 | 1,691 | 70.67 | 4,160,642 |
| Missouri | 1 | 0 | 1 | 100.00 | 1,988 |
| Nebraska | <u>32</u> | <u>16</u> | <u>48</u> | 66.66 | <u>255,871</u> |
| Total | 1,228 | 512 | 1,740 | 70.57 | 4,418,501 |
| Total Completions | 1,460 | 1,212 | 2,672 | 54.64 | 8,232,094 |

Table 2. North Mid-Continent Production, 1986-1989

| | 1986 | 1987 | 1988 | 1989 | Cumulative Total to Dec. 31. 1989 |
|------------|-------------------|-------------------|-------------------|-------------------|-----------------------------------|
| Oil (bbl) | | | | | |
| Kansas | 66,864,822 | 59,875,985 | 59,823,981 | 56,029,628 | 5,657 million (recorded) |
| Missouri | 153,574 | 120,000 | 156,358 | 134,739 | 4,464,498 |
| Nebraska | <u>7,097,633</u> | <u>6,090,931</u> | <u>5,978,429</u> | <u>6,231,544</u> | <u>441,177,000</u> |
| Total | <u>74,116,029</u> | <u>66,086,916</u> | <u>65,958,768</u> | <u>62,395,911</u> | <u>6,102,641,498</u> |
| Gas (mmcf) | | | | | |
| Kansas | 451,994 | 458,977 | 580,970 | 593,456 | 30,589,560 (recorded) |
| Missouri | 4.2 | 4.2 | 4.2 | 4.2 | 13.6 |
| Nebraska | <u>1,403.5</u> | <u>1,260.5</u> | <u>910.5</u> | <u>878.5</u> | <u>278,944</u> |
| Total | <u>453,401.7</u> | <u>460,241.7</u> | <u>581,884.7</u> | <u>594,338.7</u> | <u>30,868,517</u> |

Table 3. Kansas Selected Discoveries and Important Dry Exploratory Wells, 1989

| Map No. (Fig. 1) | County, Location | Operator, Well No., Lease | Comp. Date (mo-yr) | Total Depth (ft) | Name of Formation at TD | Prod. Depth (ft) | Producing Formation | Initial Daily Production | Field or Pool | Explor. Class |
|---------------------------------|-------------------------------|-------------------------------------|--------------------|------------------|-------------------------|------------------|---------------------------|--------------------------|----------------------------|--------------------------------------|
| SELECTED DISCOVERIES | | | | | | | | | | |
| 1 | Morton Sec. 04-T32S-R39W | Oxy USA 1 B. Israel | 12-88 | 6,278 | St. Louis | 5538-5550 | Morrow | F 168 BOPD 827 MCFGD | Kinsler East | DPT Anadarko basin |
| 2 | Stevens Sec. 24-T31S-R35W | McCoy Pet. 1-24 A. Lahey | 01-89 | 5,853 | Mississippian | 5525-5550 | Morrow | P 342 BOPD 78 MCFGD | Lahey | DPT Anadarko basin |
| 3 | Morton Sec. 09-T31S-R40W | J.M. Huber 1 Williams | 11-88 | 5,700 | Mississippian | NA | Morrow | oil gas-TSTM | Will-Bros | DPT Anadarko basin |
| 4 | Stanton Sec. 25-T29S-R39W | Arco Oil & Gas 1 P.E. Plummer | 01-89 | 5,851 | St. Louis | 5657-5671 | St. Louis | oil | Big Bow | DPT Anadarko basin |
| 5 | Kearny Sec. 24-T25S-R35W | Brandt Prod. 1-A Nat'l Bankette | 07-89 | 5,050 | Mississippian | 4953-4970 | Morrow | P 174 BOPD | Orange J Northwest | DPT Anadarko basin |
| 6 | Finney Sec. 06-T21S-R33W | Chief Drlg. 1 Daniels | 07-89 | 4,875 | Mississippian | 4675-4702 | Morrow | P 100 BOPD | Buerke North | DPT Anadarko basin |
| 7 | Seward Sec. 05-T32S-R33W | Anadarko H-1 Morgan | 11-87 | 5,810 | Mississippian | 5559-5566 | Chester | 1.79 MMCFGD | Angman | NFW Anadarko basin |
| 8 | Haskell Sec. 36U-T29S-R33W | Berexco, Inc. 1 Masoner | 02-89 | 5,796 | Marmaton | NA | Marmaton | oil | Lemon East | DPT Anadarko basin |
| 9 | Scott Sec. 27-T17S-R31W | Slawson Expl. 1 P. Gruver | 02-89 | 4,570 | Mississippian | NA | Lansing-K.C. Marmaton | oil | Manning Twst. Southwest | NFW Anadarko basin |
| 10 | Scott Sec. 16-T18S-R31W | Slawson Expl. 1 O. Reifschneider | 05-89 | 4,671 | Mississippian | 4272-4333 | Pleasanton | P 140 BOPD 3 BWPD | Beckley North | DPT Anadarko basin |
| 11 | Wallace Sec. 32-T15S-R42W | Trans-Western Pet. 2-32 Berquist | 03-86 | 5,300 | Mississippian | 5121-5146 | Morrow | P 320 BOPD 80 MCFGD | Stockholm Southwest | Development |
| 12 | Wallace Sec. 01-T15S-R43W | TXO Prod. 2 A. Hibbert | 02-88 | 5,300 | Mississippian | 5166-5174 | Morrow | P 243 BOPD | Arapahoean | Development |
| 13 | Ness Sec. 06-T16S-R21W | Carmen Schmitt 2 GSL | 11-88 | 4,410 | Mississippian | NA | Cherokee | P 120 BOPD | Branzina | NPW Anadarko basin |
| 14 | Clark Sec. 29-T32S-R22W | Source Pet 1 A. Van Baricum | 04-89 | 6,860 | NA | 4494-4699 | Lansing- Kansas City | F 1,400 MCFGD | Blaricum | OWWO Anadarko basin |
| 15 | Clark Sec. 13-T33S-R24W | Allen Drlg. 2-13 Redcliff Farms | 04-88 | 7,080 | Arbuckle | 6836-6852 | Arbuckle (Viola disc.) | 30 BOPD 70 BWPD | Redcliff | Development |
| 16 | Comanche Sec. 02-T35S-R20W | Robert & Murphy 1-2 Box Ranch | 02-88 | 7,000 | Mississippian | NA | Mississippian | oil | Box Ranch | NPW Anadarko basin |
| 17 | Ford Sec. 23-T25S-R21W | Trans Pacific Oil 1 Hubbell OWWO | 03-89 | 4,800 | Mississippian | NA | Cherokee | NA | Bellefont South | NPW Anadarko basin |
| 18 | Ford Sec. 24-T25S-R21W | Hinkle Oil 1 Weiss | 03-89 | 4,860 | Mississippian | NA | Osage Mississippian | NA | Ford Northwest | NPW Anadarko basin |
| 19 | Thomas Sec. 32-T09S-R31W | Morrison-Dixon 1 Ostmeyer | 11-89 | 4,684 | Mississippian | 4310-4320 | Lansing | 85 BOPD no water | Ostmeyer | NFW Anadarko basin |
| 20 | Thomas Sec. 21-T09S-R32W | Brito Oil 1-21 Renner | 09-89 | 4,730 | Mississippian | 4351-4354 | Lansing- Kansas City | 150 BOPD 4 water | OHL Northwest | NFW Anadarko basin |
| 21 | Rooks Sec. 19-T06S-R20W | Ritchie Expl. 1 B. Wyrill-19 | 03-89 | 3,820 | Arbuckle | NA | Lansing- Kansas City | NA | Rill | NPW Central Kansas uplift |
| 22 | Rush Sec. 36-T16S-R20W | Baleron Oil 1-31 Boe Littler | 09-88 | 3,831 | Arbuckle | 3823-3832 | Arbuckle | oil | Roland Southeast | Development Central Kansas uplift |
| 23 | Barber Sec. 03-T34S-R12W | Cross-Cont'n Res 1-13 Farney | 01-89 | 5,200 | Simpson | 4782-4792 | Mississippian | P 30 BOPD 45 BWPD | Groendycke | NFW Sedgwick basin |
| IMPORTANT DRY EXPLORATORY WELLS | | | | | | | | | | |
| 24 | Lincoln Sec. 16-T11S-R09W | C. Kosarek 1 N. Merrill | 11-89 | 4,080 | Reagan | | | D&A | | NFW Salina basin |
| 25 | Brown Sec. 20-T04S-16E | Olympic Pet. 1 Strube Martin | 09-89 | 3,024 | Hunton | | | SWD | | Forest City basin |

F = flowing, P = pumping, TSTM = too small to measure, SWD = saltwater disposal.

Table 4. Missouri Important Dry New-Field Wildcats, 1989

| Map. No. (Fig. 2) | County, Location (Sec.-Twp.-Rge.) | Operator, Well Number, Lease | Comp. Date (m-y) | Total Depth (ft) | Name of Formation at Total Depth | Remarks |
|----------------------|---|-------------------------------------|------------------------|------------------------|--|---|
| 1 | Atchison 21-64N-39W | Stone Petroleum 1 Thieman | 1-89 | 4005 | Precambrian | 5 mi northeast of Runamuck field |
| 2 | Atchison 8-64N-40W | Delphi International 1 Stanton | 3-89 | 3097 | Ordovician | 7 mi north of Runamuck field |
| 3 | Atchison 36-66N-42W | Owen Berthelsen 1 Holmes | 1-90 | 1800 | Pennsylvanian | 17 mi northwest of Tarkio field |
| 4 | Holt 29-63N-40W | Stone Petroleum 1 Central Agency | 2-89 | 4537 | Precambrian | 2 mi southwest of Runamuck field |
| 5 | Holt 28-63N-40W | Stone Petroleum 2 Central Agency | 5-89 | 3720 | Precambrian | 2 mi south of Runamuck field |
| 6 | Holt 19-63N-40W | Stone Petroleum 1 Howard | 12-88 | 3417 | Precambrian | 2 mi west of Runamuck field |
| 7 | Holt 31-63N-40W | Stone Petroleum 1 Heits | 7-89 | 4028 | Precambrian | 3 mi southwest of Runamuck field |
| 8 | Knox 10-62N-13W | Earth Reference Systems 1 Shahan | 10-89 | 1101 | Ordovician | 75 mi west of Kellerville field, Illinois |
| 9 | Schuyler 25-66N-15W | Earth Reference Systems 1 Beeler | 10-89 | 2147 | Cambrian | 85 mi west of Plymouth-Colmar field, Illinois |

Table 5. Nebraska Production, 1985-1989

| | 1985 | 1986 | 1987 | 1988 | 1989 | Cummulative Total to 12/31/89 |
|------------|-----------|-----------|-----------|-----------|-----------|-------------------------------------|
| Oil (bbl) | 6,942,502 | 7,097,633 | 6,090,931 | 5,978,429 | 6,231,544 | 441,177,000 |
| Gas (mmcf) | 1,944.6 | 1,403.5 | 1,260.5 | 910.5 | 878.5 | 278,944 |

Table 6. Nebraska Exploration and Development Drilling, 1989

| | Successful Wells | Dry | Total | Success (%) | Footage for All Wells |
|-------------------|---------------------|-----|-------|----------------|--------------------------|
| Exploratory Tests | 14 | 45 | 59 | 23.72 | 295,953 |
| Development Tests | 32 | 16 | 48 | 66.67 | 255,871 |

Table 7. Nebraska Wells Completed in 1989

| County | Wildcat | | Development | | Facility |
|--------------|---------|------|-------------|------|----------|
| | (Prod.) | D&A) | (Prod.) | D&A) | |
| Banner | 3 | | 3 | 2 | |
| Chase | | 5 | | | |
| Cheyenne | 2 | 7 | 1 | 1 | 3 |
| Deuel | | | | | 5 |
| Dodge | | 1 | | | |
| Dundy | | 6 | | | |
| Frontier | | | 1 | | |
| Furnas | | | 2 | | |
| Hayes | 3 | 8 | 4 | 3 | |
| Hitchcock | 1 | 2 | 5 | 5 | 1 |
| Kimball | 2 | 3 | 9 | 2 | |
| Lincoln | 1 | 1 | | | |
| Morrill | 2 | 2 | 3 | | |
| Red Willow | | 4 | 2 | 2 | 2 |
| Richardson | | 2 | | 1 | |
| Scotts Bluff | | 1 | 2 | | |
| Sioux | | 3 | | | |
| Total | 14 | 45 | 32 | 16 | 11 |