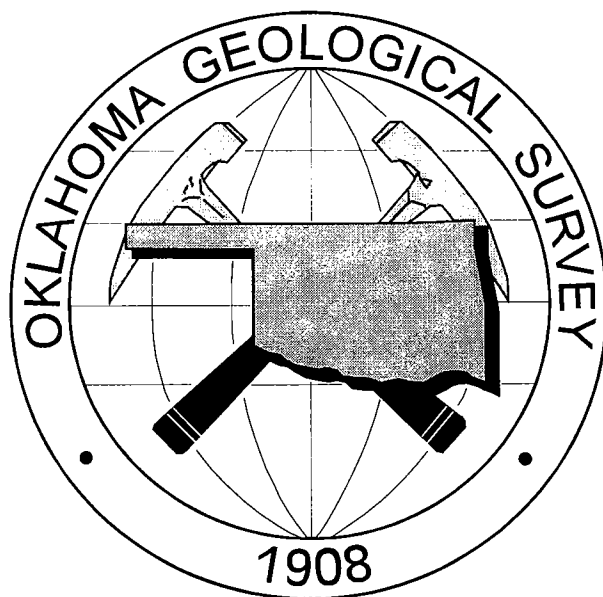


**Oklahoma Geological Survey
Open-File Report 7-97**

**Oklahoma
Coalbed-Methane
Completions
(1988-1996)**



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1997

Summary

The coalfield in eastern Oklahoma is divided into the northeast Oklahoma shelf and the Arkoma basin (Fig. 1). The commercial coal belt contains coal beds of minable thickness; coal beds in the noncommercial coal-bearing region are too thin or deep for mining. Coalbed-methane (CBM) exploration has occurred in both areas.

The following summary of Oklahoma CBM completions from 1988–1996 is based on information available and interpreted from the Petroleum Information Mid-Continent Region Newsletter, oil- and gas-well completion cards, and Oklahoma Geological Survey Natural Resources Information System (NRIS). Since not all of the wells are reported as CBM gas wells, some interpretation was necessary. Furthermore, multiple intervals, including coal beds, were perforated in some wells (e.g., Aztec Energy); commingled wells are included only in Figures 2–4 and Table 1, but are excluded from Table 2 and the remaining illustrations. This summary is incomplete since some wells may not have been known to be CBM wells or were not reported by the time of this compilation.

Table 1 summarizes 235 CBM completions in Oklahoma by 21 operators from 1988–1996. There has been activity (including reports of new locations and completions) in Haskell, Latimer, Le Flore, and Pittsburg Counties in the Arkoma basin, and Nowata, Osage, Rogers, Tulsa, and Washington Counties in the northeast Oklahoma shelf area (Fig. 2). There have been no CBM completions (only reports of new locations) reported in Osage, Rogers, or Tulsa Counties for the years 1988–1996 by the time of this compilation.

Figures 3 and 4 illustrate the principal CBM operators and areas of exploration in Oklahoma, based on 235 completions. Thirteen operators with 1–4 CBM completions are included as “other” in Fig. 3 and listed in Table 1. CBM activity began in 1988 with methane production from the Hartshorne coal in the Kinta anticline in Haskell County by Bear Production (Tables 1, 2). (Tectonic setting is interpreted from Arbenz [1956] and Iannacchione and Puglio [1979]). By 1992, Bear Production was joined by Aztec Energy, CWF Associates, and Redwine Resources in the Arkoma basin. Aztec Energy was active in the Gilmore and Midland anticlines of Le Flore County from 1992–1994. CWF Associates was active in the Spiro anticline of Le Flore County from 1991–1994; Friedman (1982) described three areas that were favorable for CBM exploration in eastern Oklahoma, including the Spiro area. Redwine Resources was active in the Russellville syncline in Haskell and Pittsburg Counties from 1992–1994. Continental Resources began CBM exploration in the Kinta anticline in 1994. The year 1994 records a change in operators (OGP Operating in place of CWF Energy in the Spiro anticline; Continental Resources in place of Redwine Resources) and a new focus in the northeast Oklahoma shelf (Dome Engineering and WestAmerica Corporation). For the period 1988–1996, the maximum number of CBM completions reported for a single year was 66 in 1992. For the period 1988–1996, the maximum number of CBM completions by a single operator is 56 by Bear Production (Table 1).

Based on depth to the top of coal beds, Figure 5 shows the range in depth of 188 CBM completions from 346–3,114 ft, with an average of 1,083 ft. Using the same data and grouped in 200 ft increments, Figure 6 shows the depth range of CBM completions by operator. The deepest CBM completions are by Continental Resources in the Arkoma basin. Figure 7 shows the depth range by coal bed. The coal beds producing methane are the Hartshorne, McAlester, and “Savanna” (Cavanal ?) coals of Desmoinesian (Middle Pennsylvanian) age in the Arkoma basin and the Riverton, Rowe, Croweburg, and “Mulky” (Iron Post ?) coals of Desmoinesian age in the northeast Oklahoma shelf area. “Other” includes Riverton coal (1,000–1,200 ft) and “Savanna” coal (1,400–1,600 ft). Hemish (1988) reported thicknesses for coal beds in the Arkoma basin (0.7–7.0 ft, Hartshorne; 1.0–5.0 ft, McAlester) and the northeast Oklahoma shelf (0.1–0.3 ft, Riverton; 0.2–2.5 ft, Rowe; 0.2–3.4 ft, Croweburg; 0.5–0.8 ft, Mulky). Hemish (1986) reported that a maximum thickness of 10 in. for the Mulky coal occurred in three drill holes in secs. 13 and 22, T28N, R19E in Craig County. The Mulky coal has not been recognized outside of Craig County in Oklahoma. Examination of electric logs in Washington County suggest that reports of CBM completions in the “Mulky” coal may be the Iron Post coal (LeRoy A. Hemish, personal communication, 1997). A CBM completion by Indian Nation Illuminating (1 Leon Lanoy, sec. 36, T1N, R10E) is reported to be in the “Lehigh” coal, equivalent to the McAlester coal (800–1,000 ft). The deepest CBM completions are in the Hartshorne coal in the Arkoma basin. Figure 8 shows the depth range by initial potential (in thousand cubic feet of gas per day, MCFGPD). The intervals 0–39 and 40–79 MCFGPD span the entire depth range. The interval 160–199 MCFGPD occurs from 600–1,600 ft, and the interval 200–239 MCFGPD occurs from 1,000–2,200 ft. The highest initial potentials are not associated with the deepest completions (Fig. 9).

Based on 188 CBM completions, initial potential ranged from 3–230 MCFGPD, with an average of 52 (Fig. 10). Using the same data and grouped in 10 MCFGPD increments, Figure 11 shows the range of initial potential by operator. Continental Resources, CWF Associates/Energy, and OGP Operating have the highest initial potentials. Figure 12 shows the range in initial potential by coal bed. “Other” includes Riverton coal (10–19 MCFGPD) and “Savanna” coal (160–169 MCFGPD). The highest initial potentials are from the Hartshorne coal in the Arkoma basin; most of these occur in area 2 on Figure 4. Petroleum Information (Mid-Continent Region Newsletter, v. 44, no. 130, July 3, 1996) reported that OGP Operating, 26-1 Rice-Carden well (sec. 26, T9N, R25E) initially flowed 185 MCFGPD from perforations at 1,351–1,359 ft, and produced 40.2 MMCFG during the first four months on line.

Based on 84 wells from completions by 11 operators, Figure 13 shows the range of water from 0–65 barrels of water per day (BWPD), with an average of 8 BWPD. Most (39%) of the CBM completions had zero BWPD.

Table 2 summarizes the range of depth, initial potential, and water for eight principal CBM operators in Oklahoma (1988–1996).

Contact the author for a reading list on coalbed methane (selected references for Oklahoma).

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- Iannacchione, A.T., and D.G. Puglio, 1979, Methane content and geology of the Hartshorne coalbed in Haskell and Le Flore Counties, Okla.: U.S. Bureau of Mines Report of Investigations 8407, 14 p.

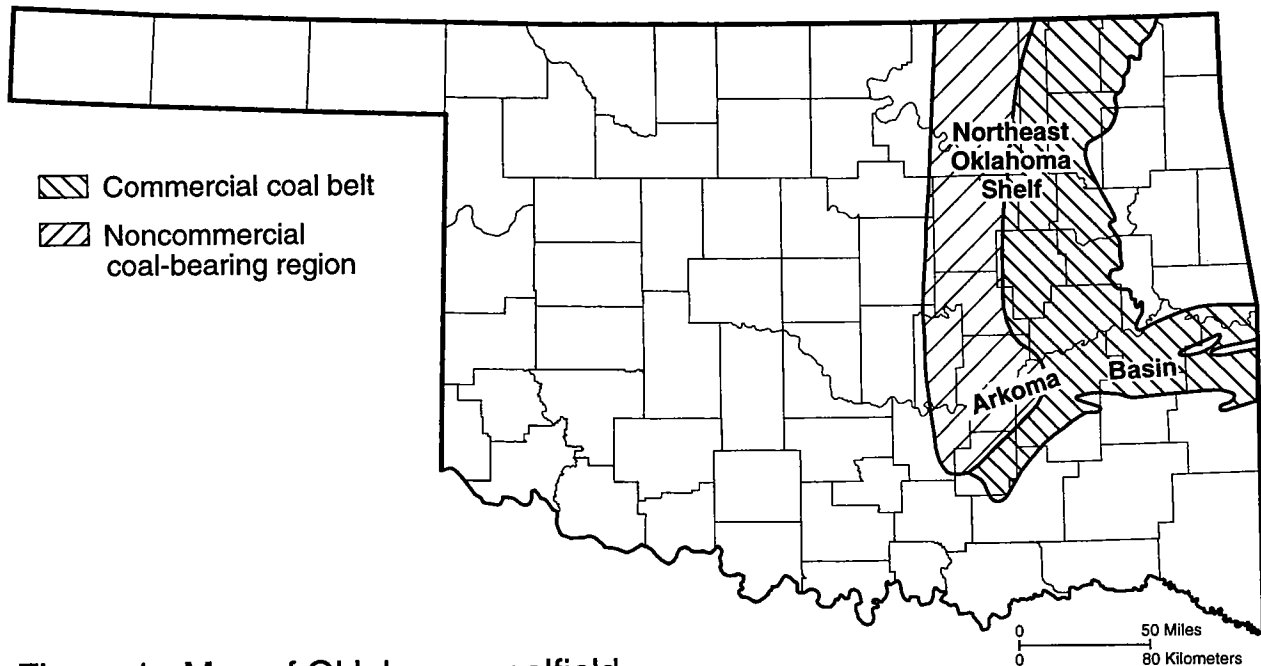


Figure 1. Map of Oklahoma coalfield.

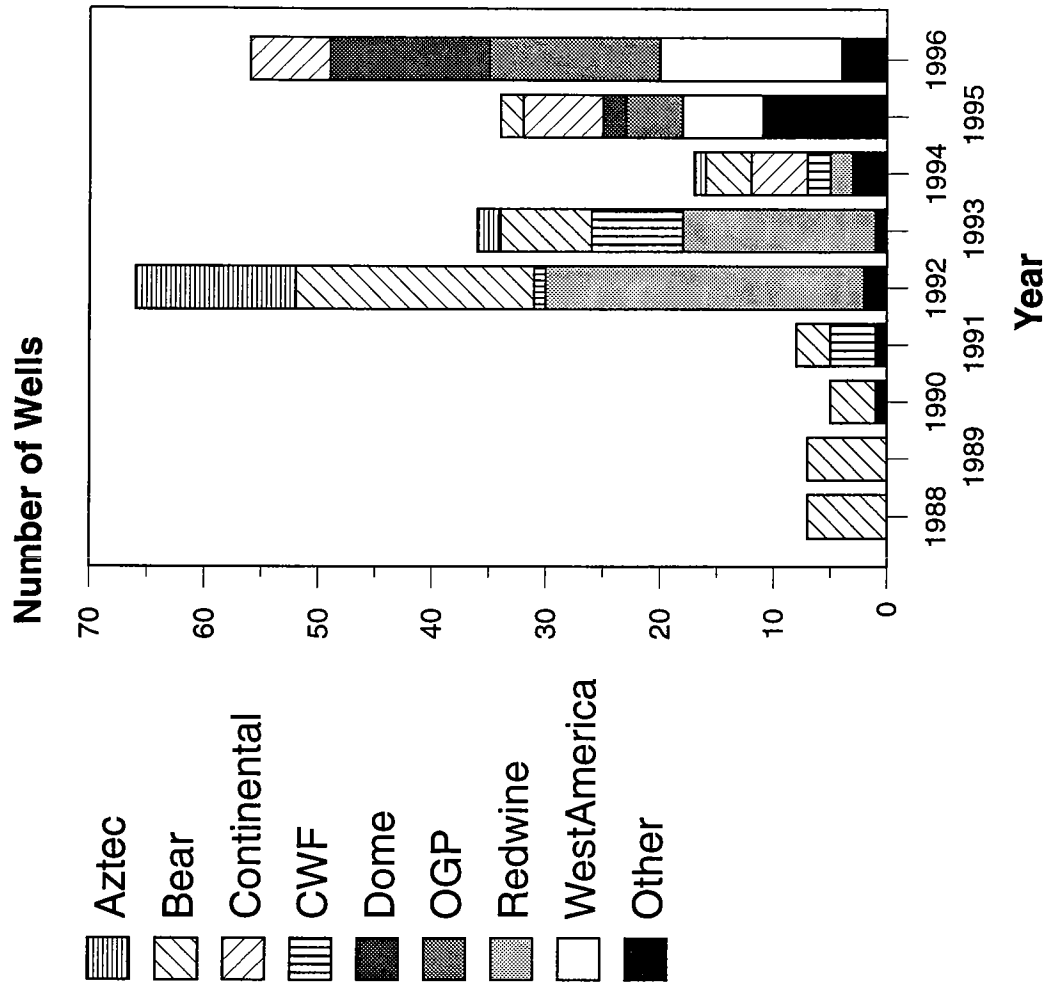


Figure 3. Principal coalbed-methane operators, 1988–1996.

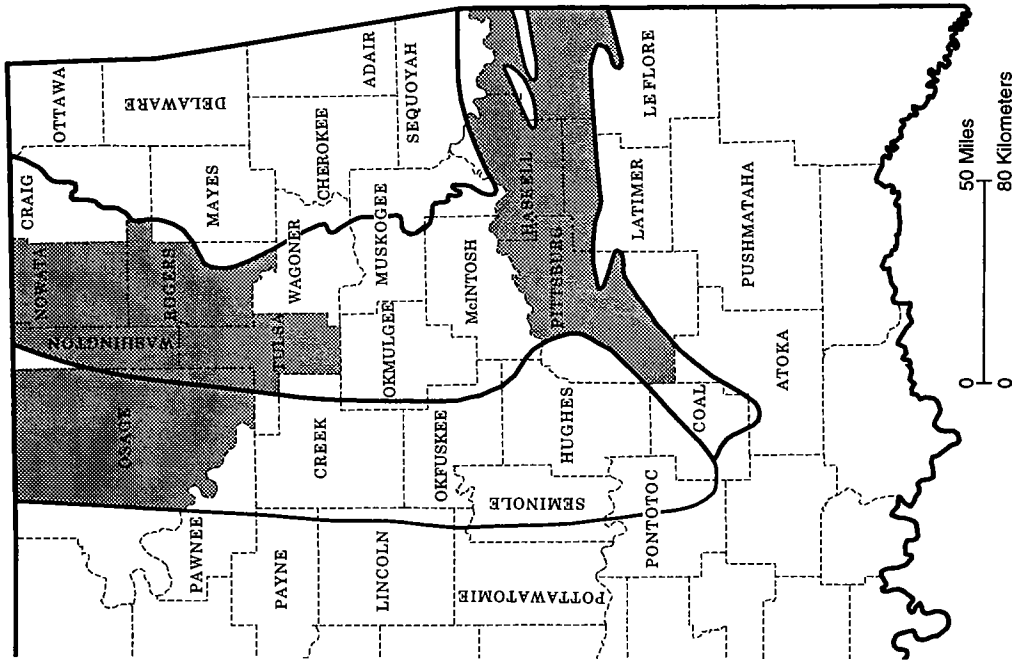


Figure 2. Map showing counties with coalbed-methane activity (1988–1996).

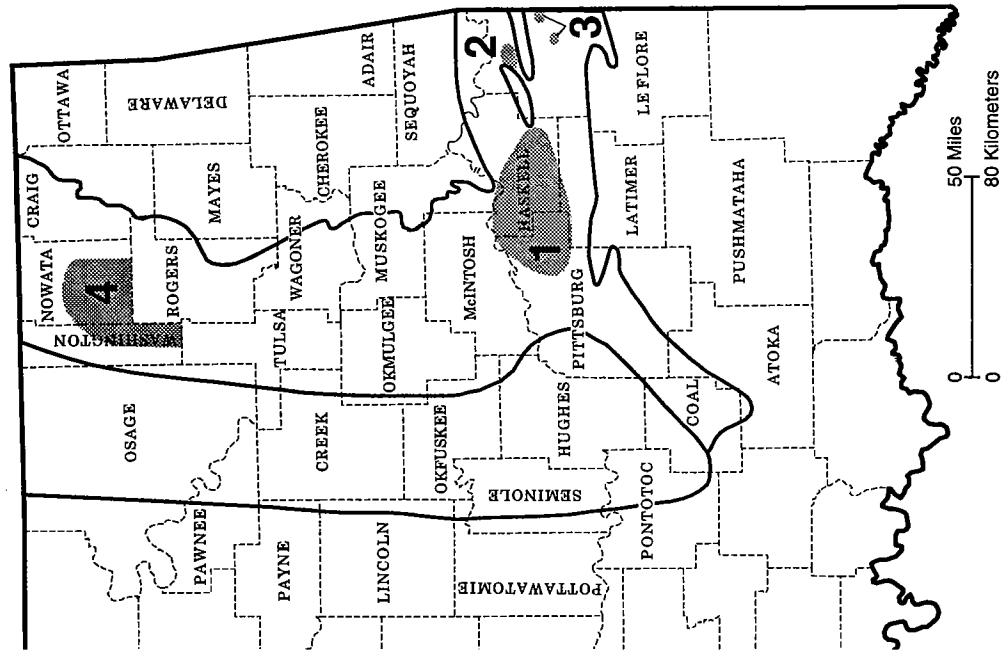


Figure 4. Map showing areas of coalbed-methane completions by eight principal operators (1988–1996). 1. Bear, Continental, Redwine; 2. CWF, OGP; 3. Aztec; 4. Dome, WestAmerica.

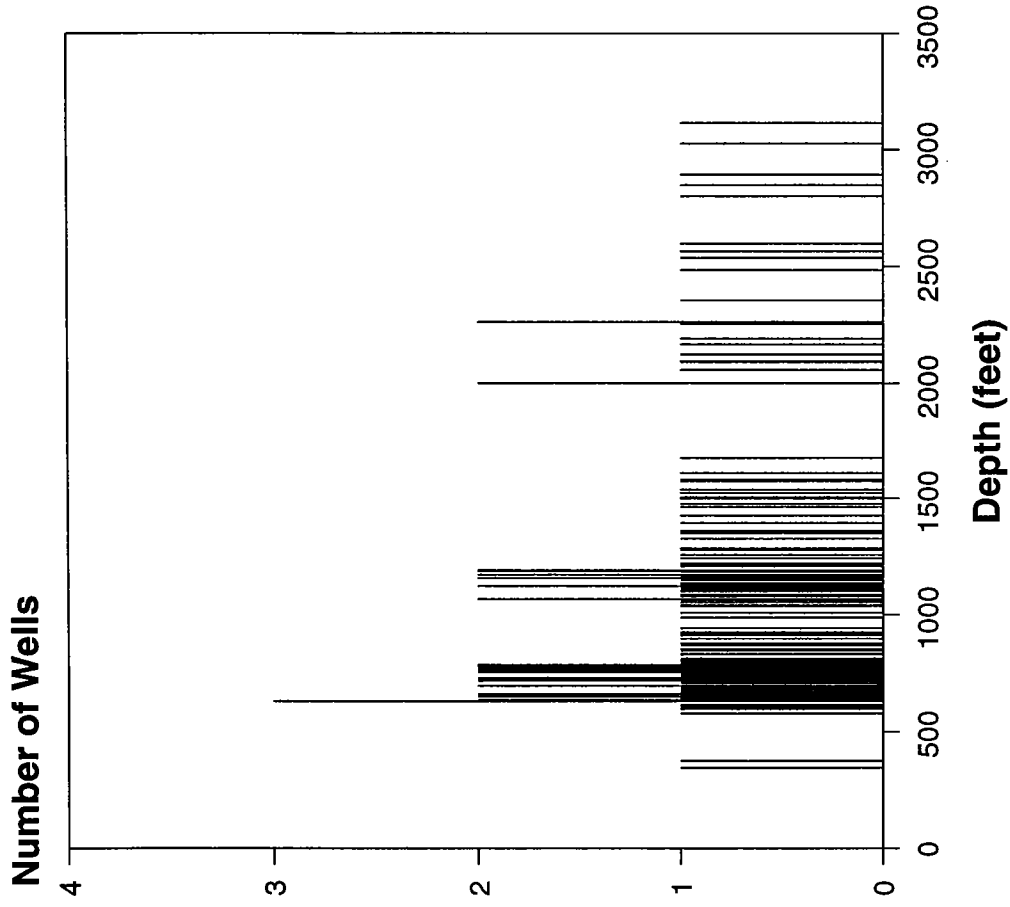


Figure 5. Depth range of CBM completions.

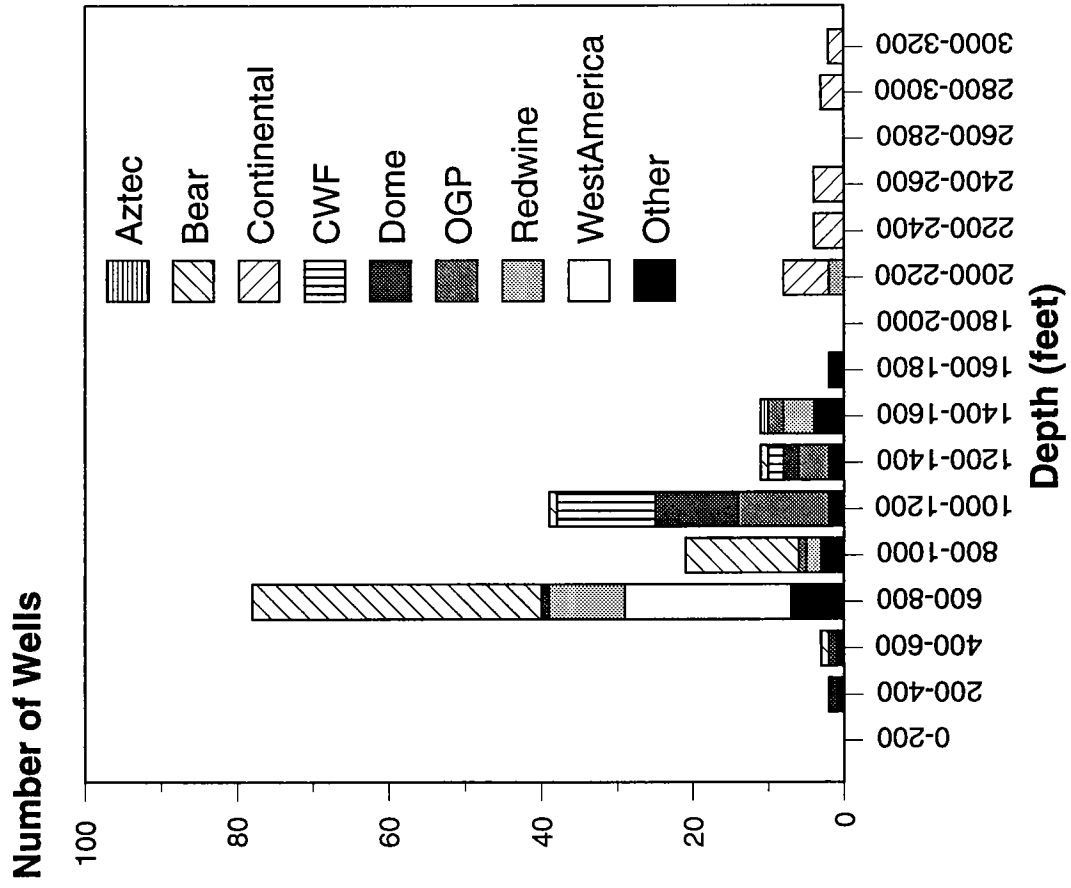


Figure 6. CBM depth vs. operator.

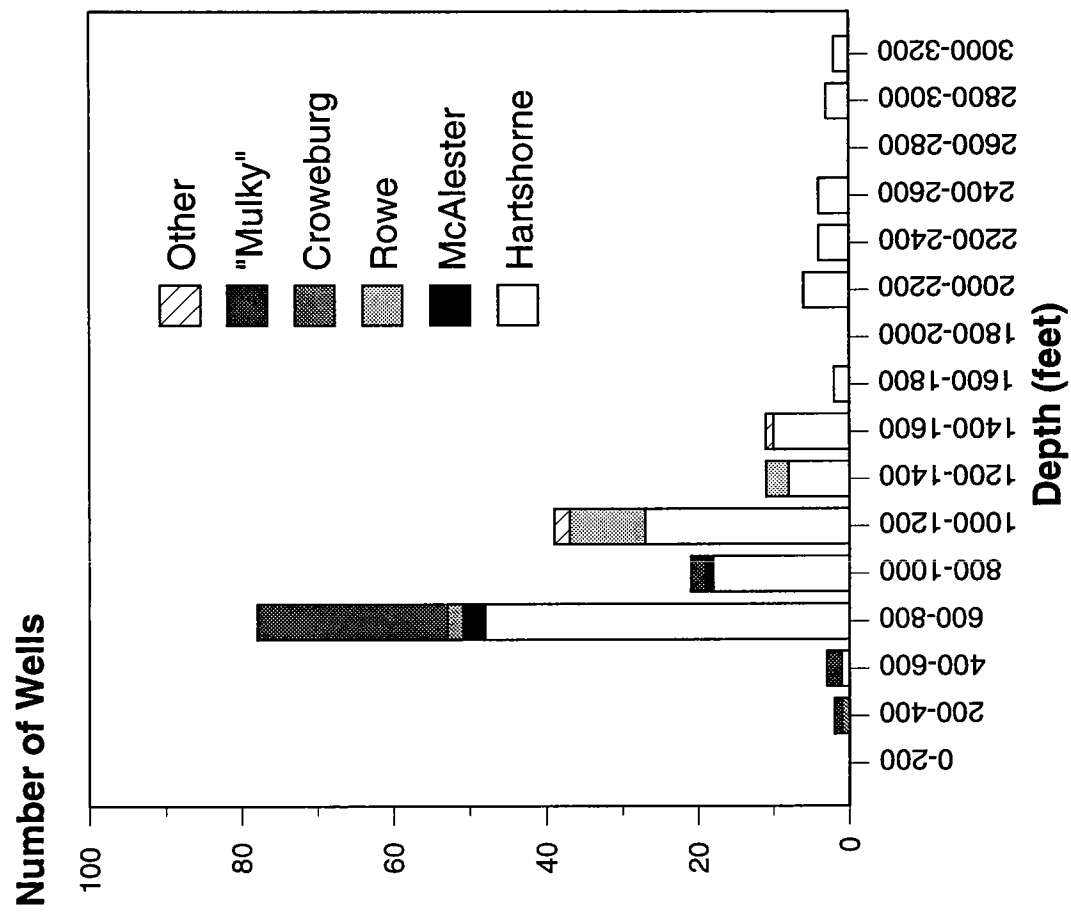


Figure 7. CBM depth vs. coal bed.

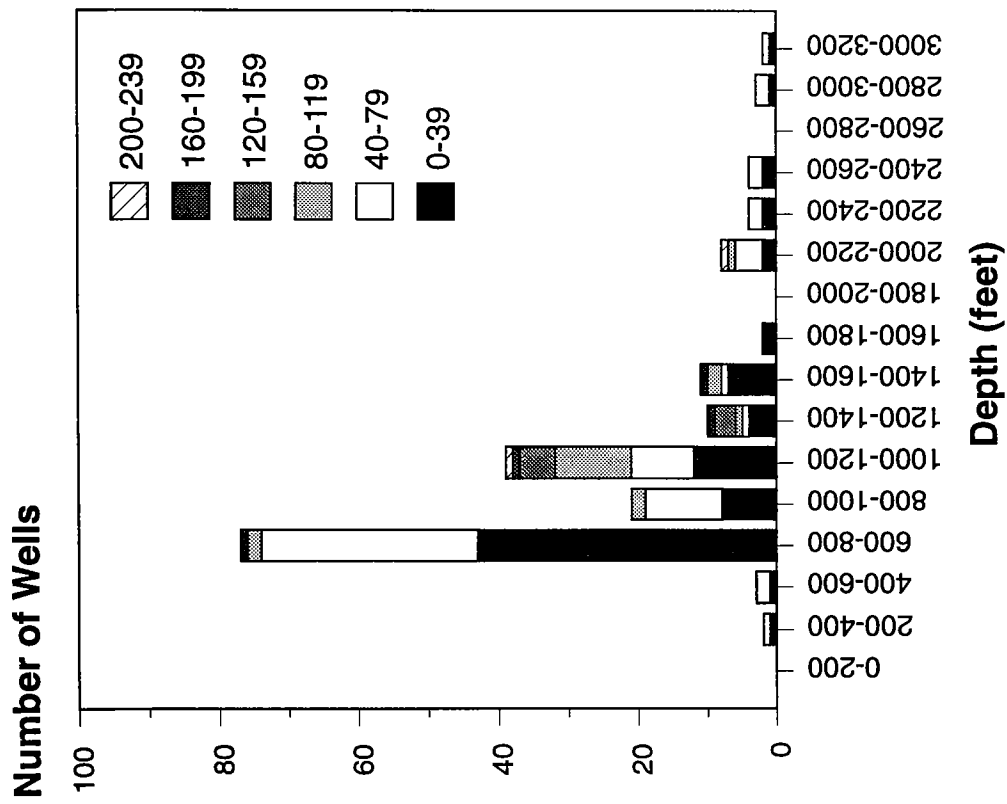


Figure 8. CBM depth vs. initial potential.

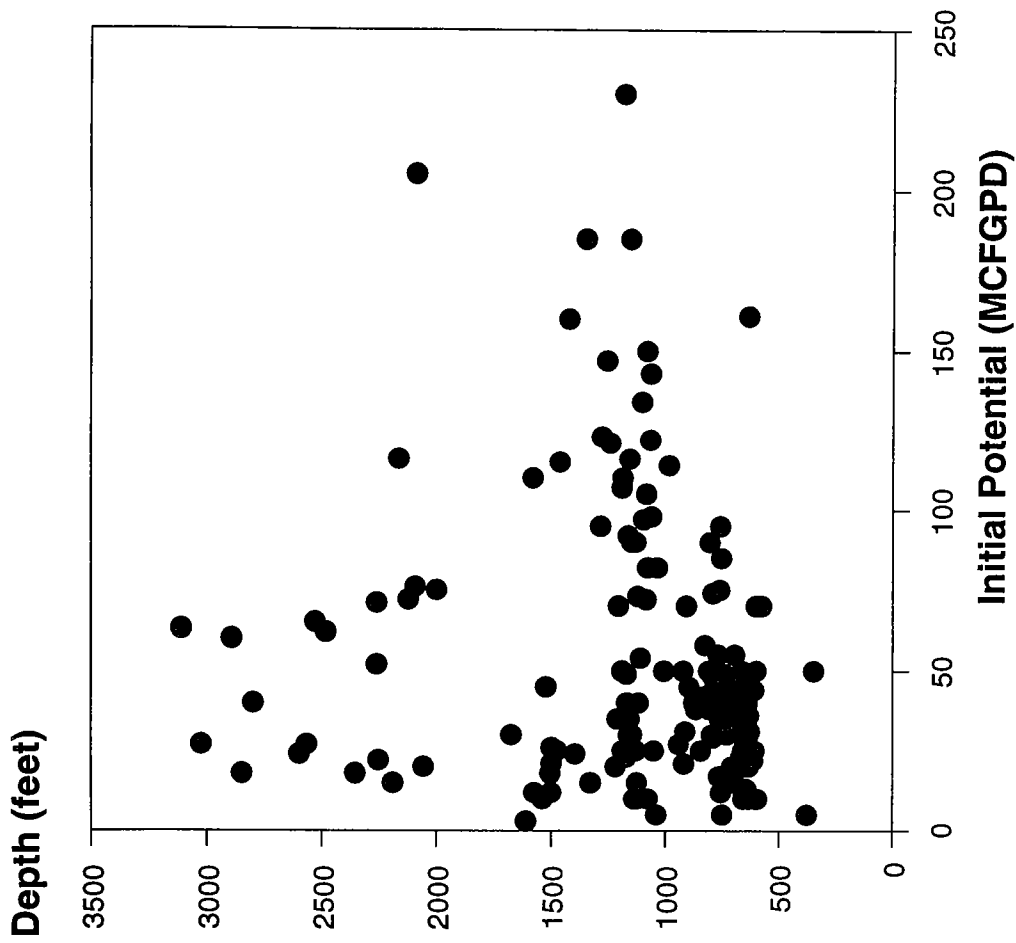


Figure 9. Scatter plot of CBM depth vs. initial potential.

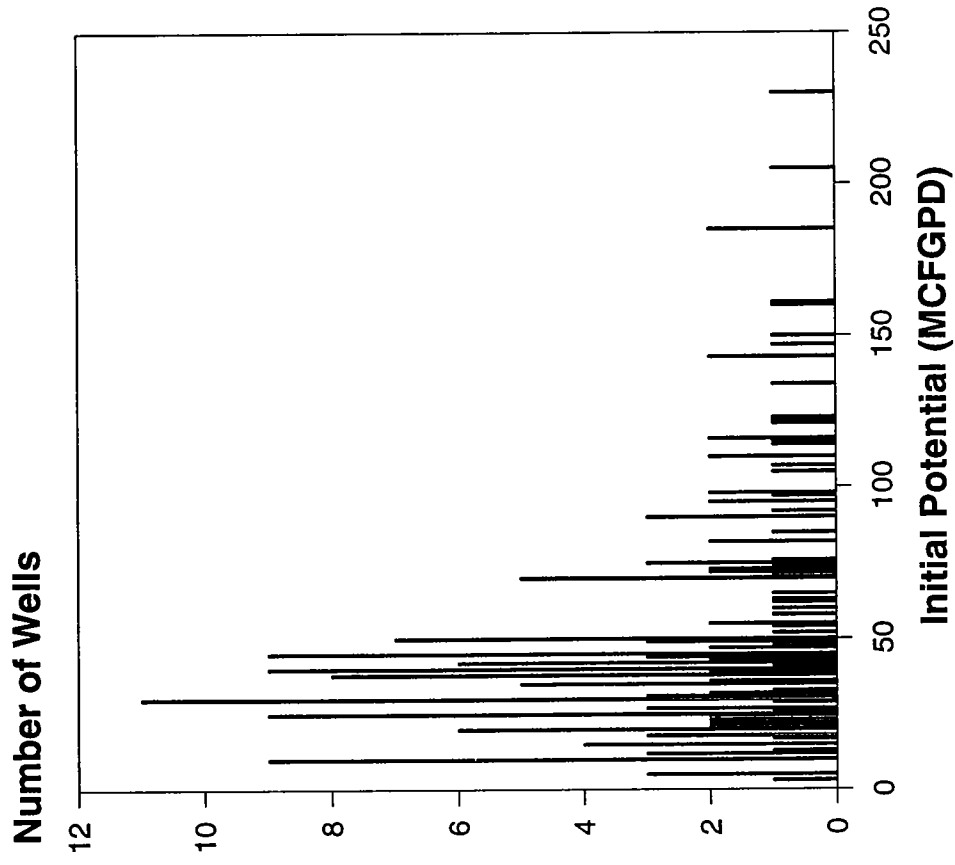


Figure 10. Initial potential range of CBM completions.

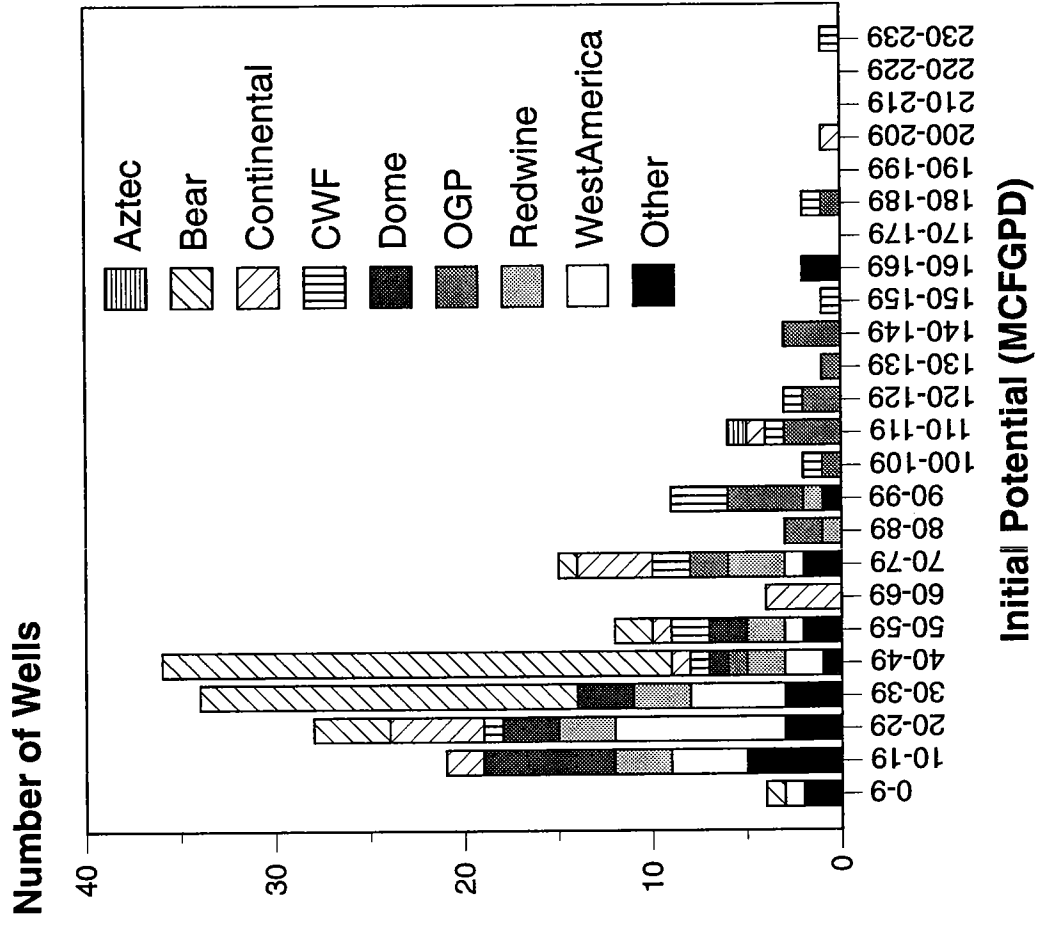


Figure 11. CBM initial potential vs. operator.

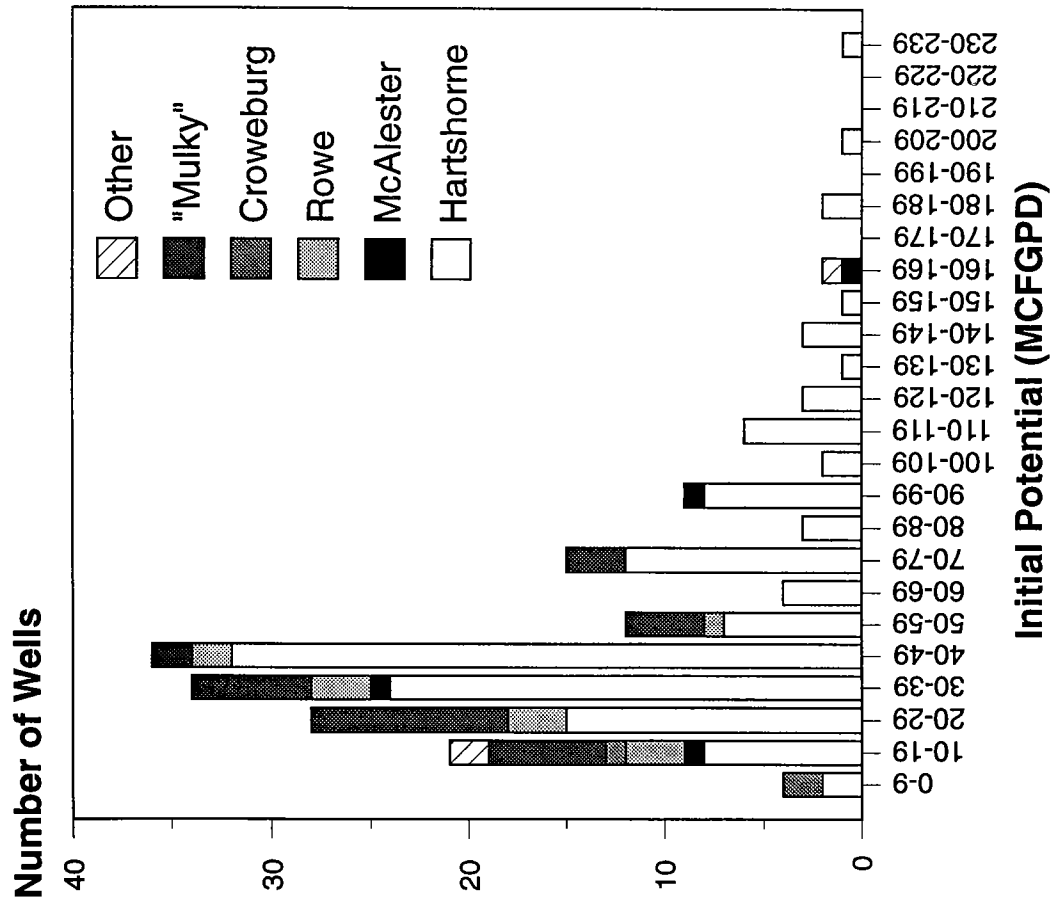


Figure 12. CBM initial potential vs. coal bed.

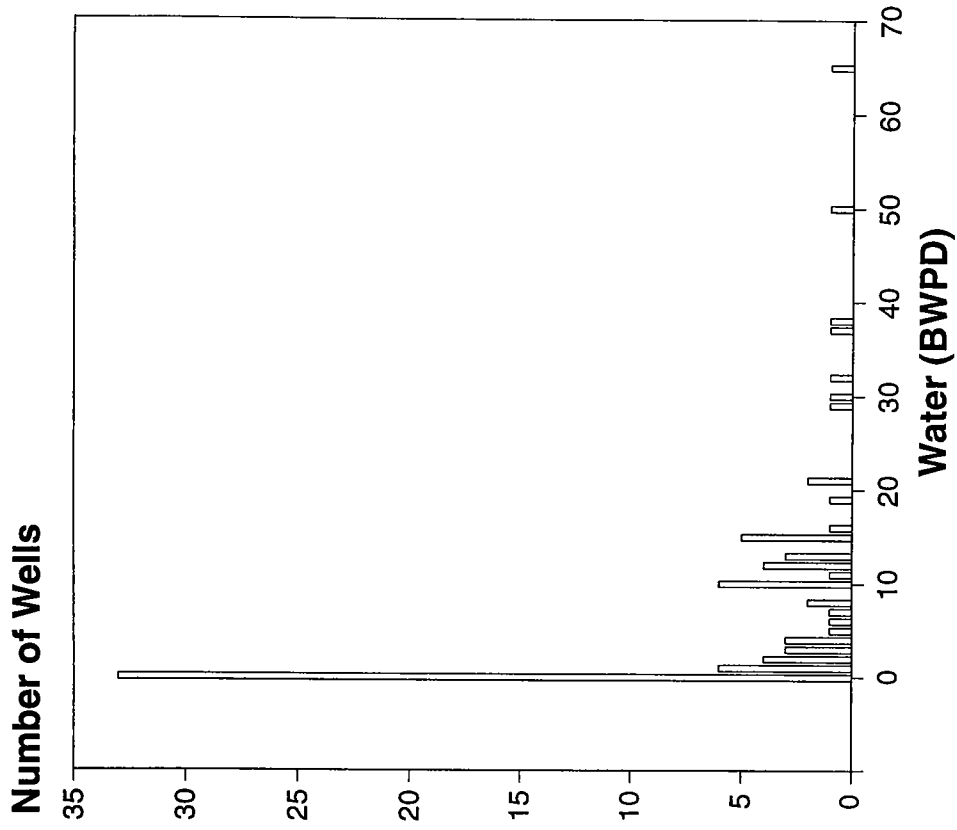


Figure 13. Water range of CBM completions.

Table 1. Summary of Oklahoma Coalbed-Methane Completions (1988-1996)

Years of Completions	Operator	Number of Wells	Coal Bed
1992	Amoco Production	1	Hartshorne
1992-1994	Aztec Energy	17	Hartshorne
1988-1995	Bear Production	56	Hartshorne
1996-1996	Brower O&G	1	"Savanna"
1995	Chew-Coast & Sons	3	"Mulky"
1994-1996	Continental Resources	19	Hartshorne
1991-1994	CWF Associates/Energy	15	Hartshorne
1995	DFP Oil	2	"Mulky"
1995-1996	Dome Engineering	16	Riverton, Rowe, "Mulky"
1995	Emerald Energy	1	Croweburg
1992	Indian Nation Illuminating	1	"Lehigh" (McAlester)
1993	Inland Oil	1	Hartshorne
1991	Jolen Operating	1	Hartshorne
1995-1996	OGP Operating	20	Hartshorne
1994	ONEOK Resources	3	McAlester
1995	Quail Creek Oil	4	Hartshorne
1995	Qualified Gas Group	1	"Mulky"
1992-1994	Redwine Resources	47	Hartshorne
1996	TEC Resources	1	Rowe
1996	Transeastern Gas	2	Rowe, "Mulky"
1995-1996	Westamerica	23	Croweburg, "Mulky"
1988-1996	21 Operators (8 operators > 4 completions)	235 completions	7 coal beds

**Table 2. Oklahoma Coalbed-Methane Completions (1988-1996):
Range of Depth, Initial Potential, and Water for Eight Principal Operators**

Operator	Total Number of Wells	Number of Wells used for Depth/Potential/[Water]	Depth Range to Top of Coal Bed (feet)	Initial Potential Range (MCFGPD)	Water Range (BWPD)	Tectonic Setting
AZTEC	17	1(1)[1]	1582	110	21	Gilmore anticline Midland anticline
CWF	15	15 (15)[15]	1008-1286	23-230	0-16	Spiro anticline
OGP	20	19(20)[10]	986-1524	45-185	0-37	Spiro anticline
BEAR	56	56(55)[29]	598-1362	5-70	0-3	Kinta anticline
CONTINENTAL	19	19 (19)[13]	2001-3114	18-205	4-38	Kinta anticline (north flank)
REDWINE	47	18 (18)[4]	730-2190	12-95	10-13	Russellville syncline
DOME	16	16 (16)[3]	346-1328	10-50	30-65	
WESTAMERICA	23	22 (23)	603-764	5-70		