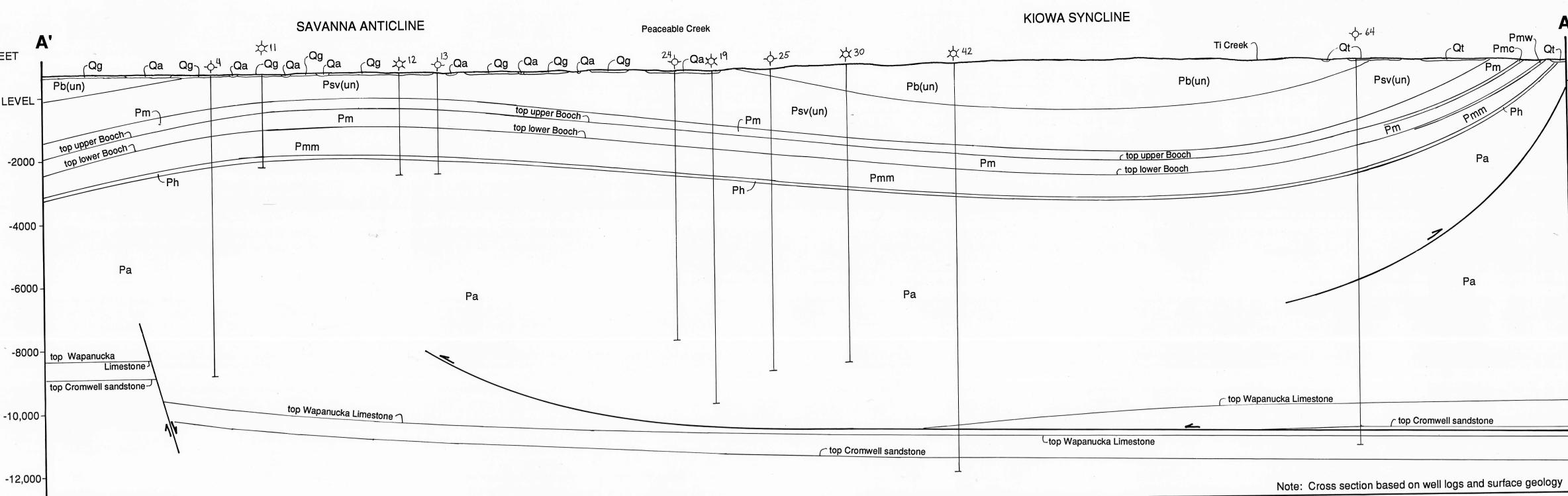
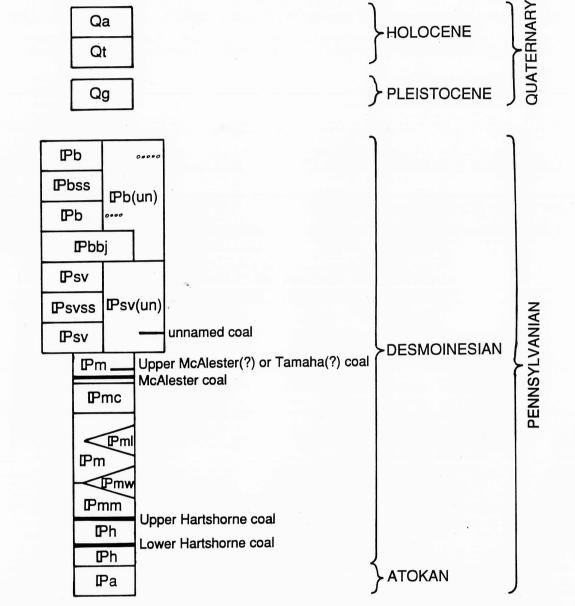


GEOLOGIC MAP OF THE SAVANNA 7.5' QUADRANGLE, PITTSBURG COUNTY, OKLAHOMA

Neil H. Suneson





DESCRIPTION OF UNITS

- af ARTIFICIAL FILL Material used for dams and railroad grades.
- Ot TERRACE DEPOSITS (QUATERNARY) Subangular to subrounded cobbles, gravel, sand, and silt forming a veneer on the surfaces of terraces that stand about 15 - 30 ft above the beds of present-day streams. Thickness: variable, but
- Qg GERTY SAND (QUATERNARY) Unconsolidated gravel, sand, silt, and clay in abandoned river channel found at elevations well above modern flood plains. Main constituents of the gravel are rounded cobbles and pebbles of quartz, quartzite, chert, gneiss, granitic rocks, and silicified wood. Thickness: varies from a thin veneer to an estimated maxiumum of 50 ft.
- 5Y4/1) to rarely dark reddish brown (10R3/4), very poorly exposed shales and siltstones (locally mapped as Pb) with several moderately well-exposed ledge- or ridge-forming fine- to very fine grained sandstones (locally mapped as Pbss). Throughout most of the quadrangle, shale and sandstone beds are mapped together as Pb(un). Shale outcrops typically contain ironstone concretions and thin siltstone beds that may be limonite-stained. Rarely, the shale contains thin conditions levers. sandstone layers. Sandstones are predominantly dark yellowish orange (10YR6/6) to grayish orange (10YR7/4) to moderate yellowish brown (10YR5/4), fine- to very fine grained and noncalcareous with abundant sedimentary structures such as ripple marks, cross-stratification, plane-parallel lamination, trace fossils, and wavy bedding. Large-scale cross-stratification and softsediment deformation féatures are less common. In the southern part of the quadrangle in the Kiowa syncline, some of the sandstones are medium- to coarse-grained and conglomeratic with angular, bleached, pebble-size chert(?) fragments as large as 1 in. diameter. Invertebrate fossils (mostly brachiopods, rarely gastropods) are locally present in the shales and as molds in the sandstones. Plant molds, including *Calamites*, are uncommon. The sandstone beds weather to large blocks, slabs, and flagstones. Stacked sandstone beds are as thick as 30 ft, but more commonly are 3 to 6 ft thick, where exposed. Formation contains a single, 1-in.-thick fossiliferous limestone bed in the SW1/4 NW1/4 SW1/4 sec. 30, T. 4 N., R. 15 E. To the east and in the northern part of the quadrangle, the base of the formation is marked by the Bluejacket Sandstone Member (Pbbj). In most of the quadrangle, the Bluejacket is thin or absent and is not recognizeable as a separate member. On the map the contact between the Savanna and Boggy Formations is marked by a dashed and/or queried line where the Bluejacket Sandstone Member is absent or unexposed. Hendricks (1937) mapped the Lower Witteville(?) coal in the north-central part of the quadrangle and Secor coal in the northeast corner of the quadrangle. Neither coal is exposed or mapped. Top of formation eroded. Maximum remaining thickness: about 3100 ft.
- to light olive gray (5Y5/2) to moderate brown (5YR3/4) very poorly exposed, fissile to platy silty shales (locally mapped as Psv) with several moderately wellexposed ridge-forming sandstones (locally mapped as Psvss). Throughout most of the quadrangle, shale and sandstone beds are mapped together as Psv(un). Shale outcrops typically contain thin beds of slitstone and rarely sandstone a well as ironstone concretions. A 1-in.-thick smutty coal associated with organicrich shale is present in the northeastern corner of the quadrangle. Most shales in the Savanna include thin, unmappable sandstone units. The sandstones are grayish orange (10YR7/4) to moderate yellowish brown (10YR5/4) to dark yellowish orange (10YR6/6)), fine- to very fine grained to rarely medium-fine grained, and noncalcareous. The sandstones are massive to thin-bedded and shaly. Soft-sediment deformation features are very common. Other less common sedimentary features include crossbeds, wavy beds, plane-parallel laminations, ripple marks, and trace fossils. Locally, individual sandstone beds pinch and swell and show large-scale (hummocky?) cross-stratification. In places, the sandstones weather to ledges composed of blocks, slabs, and flagstones of sandstone. Sandstone beds are as thick as 15 ft, but consist of stacked individual units. More typically, the sandstones are 2 to 5 ft thick. Contains rare invertebrate fossils (brachiopods) and plant casts. Thickness: varies from about 850 ft on northwest limb of Savanna anticline to about 1800 ft in southeast corner of quadrangle. Average about 1600 ft. Unusually thin section on northwest limb of Savanna anticline probably tectonic and not

Pm McALESTER FORMATION (PENNSYLVANIAN) - Consists of 4 named members including (oldest to youngest): McCurtain Shale (Pmm), Warner Sandstone (Pmw), Lequire Sandstone (PmI), and Cameron Sandstone (Pmc). Unnamed shale labelled Pm separates the named sandstones. The McCurtain Shale Member is predominantly poorly exposed olive gray (5Y3/2) to olive black (5Y2/1), fissile, spheroidally weathering, silty shale. Ironstone concretions and layers are present but uncommon. Includes very minor siltstone and sandstone beds. Thickness: 300 - 500 ft.

The Warner Sandstone Member (Pmw) is predominantly a relatively well exposed grayish orange (10YR7/4) to dark yellowish orange (10YR6/6), fine- to very fine grained, noncalcareous sandstone. Beds typically weather to slabs or flagstones and less commonly equidimensional blocks. Individual sandstone beds vary from less than 1 to over 3 ft thick and occur as isolated beds separated from others by covered intervals that are probably shale and siltstone; thicker sandstones consist of stacked beds. Ripple marks, cross-stratification, and wavy or swaley bedding characterize most beds; some beds are unstratified, show plane-parallel stratification, and/or soft-sediment deformation features. Trace fossils and dish-and-pillar structures are rare. Sandstone beds locally appear to grade into platy, flaser-bedded siltstone/sandstone sequences as thick as several tens of ft. As much as 20 ft of sandstone and covered intervals separating sandstone beds is exposed, but the unit is probably thicker and is shown that way on the map. Thickness: 0 - 200 ft.

The Lequire Sandstone Member (Pml) is a relatively well exposed fine flagstones. Sedimentary structures include ripple marks, parallel laminations, soft-sediment deformation features, and trace fossils. *Calamites* impressions are rare. Outcrops range from 3 to 10 ft thick. Thickness: 0 to 150 ft.

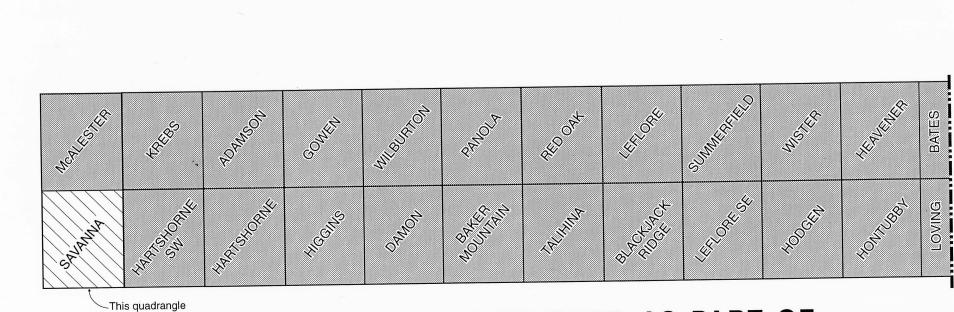
The Cameron Sandstone Member (Pmc) is a relatively well exposed, yellowish gray (5Y7/2) to dusky yellow (5Y6/4), fine- to very fine grained noncalcareous silty sandstone that typically weathers to ripple-marked slabs and flagstones. Individual outcrops vary from isolated 4- to 8-ft-thick sandstone beds to stacked sandstones over 100 ft thick. In the southeastern corner of the map, the Cameron shows rapid thickening and thinning. Although mapped as a single unit, the Cameron Sandstone Member includes covered intervals that separate sandstone beds and are probably shale and siltstone. Common sedimentary structures, in addition to ripple marks, include wavy bedding, large-scale crossstratification, soft-sediment deformation features, and sole marks. The sandstone locally appears to grade both up- and down-dip and along strike into flaser-bedded siltstone/sandstone sequences. Outcrop thickness locally exceeds 100 ft. Thickness: 0 - 275 ft.

Shale in the McAlester Formation (Pm) is predominantly olive gray (5Y3/2 to 5Y4/1), olive black (5Y2/1), to grayish black (N2), very poorly exposed silty shale that contains rare thin siltstone beds. Where exposed, the shale typically weathers to thin flakes or chips and locally contains iron-oxide-stained concretions and carbonized plant debris. The shale in the McAlester Formation contains the McAlester coal and Upper McAlester or Tamaha coal beds. The McAlester coal ranges in thickness from about 2 to 4 ft (Hendricks, 1937). It is McAlester coal ranges in thickness from about 2 to 4 π (Hendricks, 1937). It is about 120 ft above the top of the Cameron Sandstone Member just northeast of Blanco and ranges from 250 to 600 ft above the Cameron on the Savanna anticline in the northwestern part of the quadrangle. The coal has been locally mined and small spoils piles are present on the flanks of the Savanna anticline. A 6-in.-thick very smutty coal bed occurs about 400 ft above the Cameron Sandstone Member northeast of Blanco. This coal bed may be the Upper McAlester or Tamaha coal.

Thickness of McAlester Formation: varies from 1750 to 2500 ft. Thickest at hinge of Savanna anticline, probably due to tectonic thickening. Ph HARTSHORNE FORMATION (PENNSYLVANIAN) - Predominantly pale yellowish brown (10YR6/2) to dark yellowish orange (10YR6/6) to yellowish gray (5Y7/2), fine-grained, silty, ripple-marked, mostly thin-bedded (1 in. to 6 in.), relatively well exposed, noncalcareous sandstone interbedded with poorly exposed, platy-weathering, flaser- to lenticular-bedded siltstone and shale. Outcrops commonly form 1/2- to 2-fit-hick tombstone topography. The formation is characterized by sandstone outcrops separated by covered intervals that probably overlie shale and siltstone and may constitute as much as 75% of the formation; the apparent thickness of sandstone plus covered intervals ranges up to 150 ft. Ridges underlain by the Hartshorne Formation are typically littered with slabs and flagstones; in other places, the sandstone weathers to blocks. Some sandstone beds are continuous for hundreds of ft; others show pronounced lenticularity and thickening and thinning. Common sedimentary structures include ripple marks, crossbeds, wavy bedding, and high- and low-angle large-scale cross-stratification. The sandstone is quartzose and typically contains rare mica. Iron oxide generally coats individual grains. Carbonized plant debris locally occurs on bedding planes. The Hartshorne Formation contains two Hartshorne coal is about 3.5 ft thick immediately southwest of Blanco (south of quadrangle)(Hendricks, 1937); the Upper and Lower Hartshorne coals are about 3.5 ft thick on the southeast flank of the Savanna anticline immediately west of the quadrangle. Small abandoned slope mines on the flanks of the Savanna anticline are the only surface evidence for the Hartshorne coals in the quadrangle. Thickness of formation: 200 - 400 ft.

Pa ATOKA FORMATION (PENNSYLVANIAN) - To the east, predominantly very poorly exposed, grayish black (N2) to olive gray (5Y3/2), slightly to very silty, fissile to platy, noncalcareous shale. No outcrops observed in this quadrangle. The Atoka Formation in this quadrangle represents the upper part of the formation. Thickness unknown. Thickness of Atoka Formation in subsurface determined from well logs: about 7000 ft.

REFERENCE CITED Hendricks, T.A., 1937, Geology and fuel resources of the southern part of the Oklahoma coal field. Part I. McAlester District: U.S. Geological Survey Bulletin 874-A, 90p.



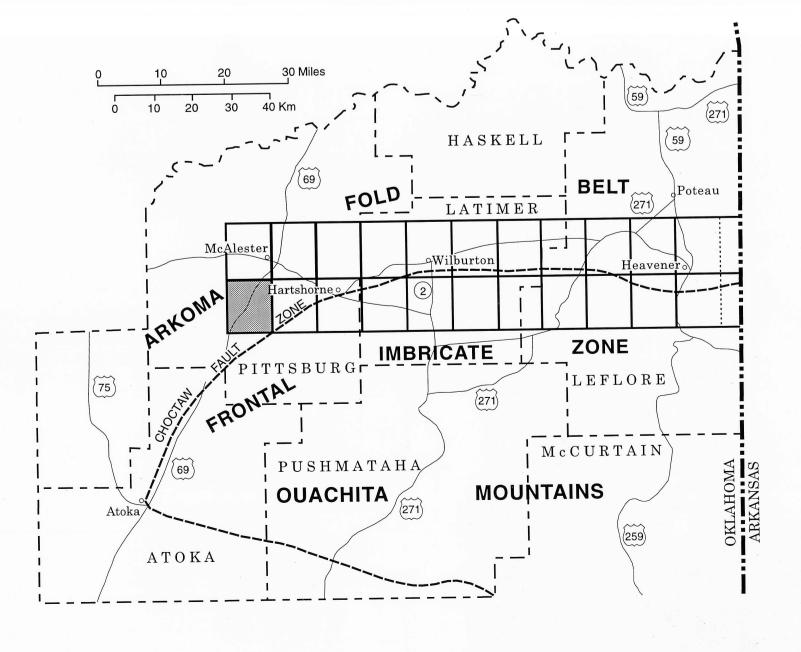
GEOLOGIC MAPS PUBLISHED AS PART OF COGEOMAP & STATEMAP PROJECTS

SYMBOLS		LIST OF WELLS SPUDDED BEFORE MAY 31, 1997 (OPERATOR, NUMBER, FARM NAME, SPUD DATE, TOTAL DEPTH)		
_	CONTACT - Dashed where approximately located; queried where			6150'
	uncertain	1. Tide West 1-25 Geraldine	n/a 6/18/81	3152'
		 Beren 1-25 Turner Berexco 1-30 Turner 	9/24/81	3210'
	COAL BOUNDARY - Approximate outcrop boundary of coal bed	4. Seagull Mid-South 1-35 SMS Rock	12/19/94	9500'
	(named on map); triangle indicates exposure of coal	5. Beren 1-35 Board	5/21/80	3201'
	TUDUOT FALILT Contacts on upper plate; detted where	6. Beren 1-36 Ward	7/27/80	3168'
	THRUST FAULT - Sawteeth on upper plate; dotted where	7. TXO 1 Turner "C"	3/10/82	3100'
	concealed	8. TXO 1 Turner	5/25/79	3700'
• • •	FAULT - Arrows show relative horizontal movement; dashed	9. Leben 1-31 Cambron	8/3/69	6287'
	where approximately located; dotted where concealed	10. Leben 1-31 Cambron "A"	8/31/69 7/4/80	9300' 2938'
		11. Beren 1-3 Boggs	2/2/80	3236'
	FAULT - Dashed where inferred; U =upthrown side, D =	12. Beren 2-2 Davis 13. Beren 1-2 Davis	10/3/79	3201'
	downthrown side	14. Beren 1-1 Alexander	3/25/81	3190'
. —	TALLY T. Displacement unknown; dochod whore approximately	15. Deck 1-9 Buckner	1/27/97	3014'
	FAULT - Displacement unknown; dashed where approximately located; dotted where concealed	16. Beren 1-10 Buckner "B"	2/6/81	3050'
	located, dotted where concealed	17. Unit 1 Raleigh	6/20/90	7013'
٠.٠	ANTICLINE - Showing crestline; arrow along axis shows direction	18. Unit 2 Smart	10/31/90	6776'
	of plunge; dashed where approximately located; dotted	19. Unit 1 Smart	9/9/81	10,500'
	where concealed	20. Sampson 1 Kenyon	12/28/86	7000' 10,472'
		21. Sampson 1 Boardwalk	10/25/81 4/13/82	10,254
••••	SYNCLINE - Showing troughline; arrow along axis shows direction	22. Tenneco 1-8 Ellis	3/11/81	11,500'
	of plunge; dashed where approximately located, dotted	23. Cotton 1 Atteberry 24. Arco 1 Kimball "D"	5/23/89	8500'
	where concealed	25. TXO 1 Kimball "C"	9/12/81	9500'
	SOAL EXPOSURE	26. Unit 2 Cable	1/30/90	6605'
	COAL EXPOSURE	27. Unit 1 Cable	11/9/87	6920'
	TRENCH	28. Tenneco 1-13 Dakil	3/13/81	9900'
_	THENOTI	29. Tenneco 1-13 Rollings	3/29/84	10,750'
2	ABANDONED STONE QUARRY	30. Unit 3 Cable	11/14/94	9400' 8325'
`		31. Santa Fe 3-18 Cable	11/21/89 2/16/83	10,000'
	ABANDONED SHAFT OR DOGHOLE	32. Tenneco 2-18 Rollins	8/9/81	10,000'
	THE STATE OF THE S	33. Tenneco 1-18 Cable 34. Amoco 4-18 Cable	3/14/96	8383'
1,2	SPOIL PILES FROM ABANDONED COAL MINE	35. Whitmar 1-17 Stipe	4/16/82	9873'
	WATER FORM LOCALITY	36. Whitmar 2-17 Stipe	8/28/88	9500'
•	INVERTEBRATE FOSSIL LOCALITY	37. Cotton 1 Battles	1/6/82	9118'
٥	CONGLOMERATE FACIES OF BOGGY FORMATION	38. Tenneco 1-22 Walker	7/11/79	9100'
000	CONGLOWERATE FACIES OF BOOKET TO HINATION	39. TXO 1 Crabtree "B"	4/4/80	9400'
· · · · ·	MARKER BED	40. TXO 1 Crabtree "C"	7/20/80	7725'
	WAINERBEB	41. TXO 1 Harris "i"	11/19/81	12,012' 12,900'
		42. Seneca 1-19 Cable	7/31/82 7/16/91	15,800'
	STRIKE AND DIP OF BEDS	43. Nearburg 1 McClain 30 Federal	12/28/81	12,610'
		44. Cotton 1 Depot 45. no information	12/20/01	3000'
	Leader to location of measurement	46. Carter-Gragg 1 Mullins	7/20/61	12,605'
	Collin and dis of hade	47. Arco 2 R.L. Mullen unit	2/17/80	8500'
	Strike and dip of beds	48. TXO 2 Romine	3/7/89	8800'
	Strike and dip of beds, approximate	49. TXO 1 Romine	10/11/78	13,287'
	Strike and dip of beds, approximate	50. TXO 1 Crabtree "A"	1/10/80	8621'
	✓ Vertical beds	51. Skelly 1 J.G. Lakey	8/27/67	10,000'
	Voltion bodo	52. Supron 31-2 Turney	11/2/78	11,249' 7474'
	Undulatory beds	53. Supron 1-31 Turney	1/21/78 12/30/76	12,326'
		54. TXO 1 Harrington 55. TXO 1 Turney	6/2/79	7798'
	⊕ Horizontal beds	56. TXO 1 Turney 56. TXO 1 Davis "Q"	2/24/82	8459'
		57. TXO 1-A Pearl	4/6/84	12,840'
	OIL AND CAS WELLS	58. TXO 1 Pearl	2/2/84	12,001'
	OIL AND GAS WELLS	59. TXO 1 Branson	12/26/75	13,301'

Leader to location of wellsite

47 Number on map corresponds to list of wells

Cas well



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