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# Regional Subsurface Geologic Cross Sections of the Mississippian System, Appalachian Basin, Eastern Kentucky

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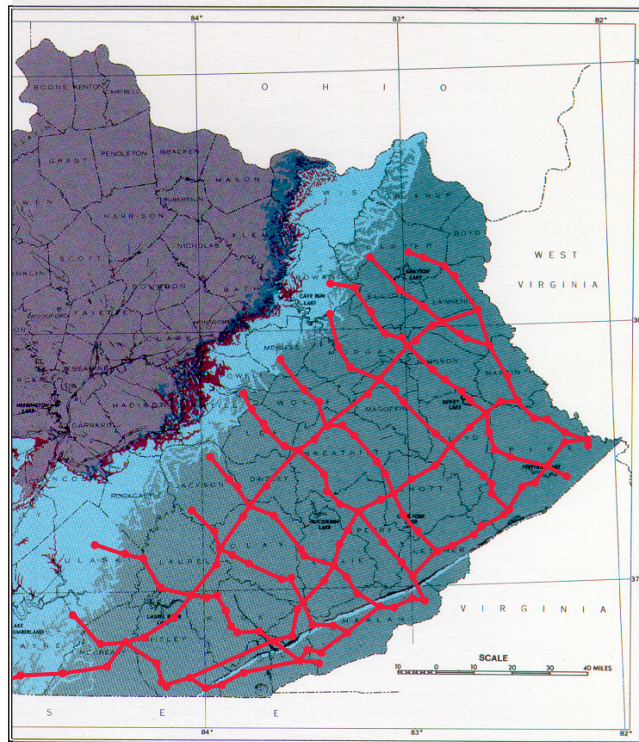
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**Kentucky Geological Survey**  
James C. Cobb, State Geologist and Director  
University of Kentucky, Lexington

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# Regional Subsurface Geologic Cross Sections of the Mississippian System, Appalachian Basin, Eastern Kentucky

David C. Harris and Thomas N. Sparks

## INTRODUCTION

This series of 14 regional cross sections illustrates subsurface stratigraphic correlations of Mississippian (upper Carboniferous) rocks in the Appalachian Basin of eastern Kentucky. These cross sections were constructed as part of a regional stratigraphic study of the Mississippian "Big Lime," a major oil- and gas-producing formation. The series illustrates 10 dip-oriented and 4 strike-oriented lines, extending from the Slade Formation outcrop belt on the northwest, to the state borders on the east and south. Stratigraphic and structural versions are shown for each section to better illustrate thickness and structural variations. These cross sections served as the regional framework during collection of stratigraphic data for the Big Lime project. Stratigraphic tops were collected for almost 8,000 wells in eastern Kentucky, from the top of the Mississippian to the Devonian black shale. Tops data shown in the cross sections are available in digital form from the Kentucky Geological Survey (Open-File Report OF-97-03).

## STRATIGRAPHY

The Mississippian Big Lime (drillers' term) is a major hydrocarbon reservoir in the Appalachian Basin of Kentucky. The Big Lime is stratigraphically equivalent to the lower Newman Limestone of Kentucky, the Greenbriar Limestone of West Virginia, and partly equivalent to the Ste. Genevieve Limestone of the Eastern Interior (Illinois) Basin. The Big Lime is middle to Late Mississippian (Meramecian to Chesterian) in age (Ettensohn, 1980). It was deposited in the Appalachian foreland basin within a broad embayment covering much of present-day West Virginia, eastern Kentucky, western Virginia, and eastern Tennessee (Youse, 1964). In most of the study area the Big Lime unconformably overlies siltstones and sandstones of the Borden Formation, an Osagean deltaic sequence (Youse, 1964; Birch, 1980; Frankie, 1990). In the southwestern part of the study area, the Big Lime overlies the Fort Payne Formation, a deeper-water marine carbonate unit above the Borden.

The Big Lime generally thickens toward the center of the Appalachian Basin to the southeast, ranging in thickness from zero in the outcrop belt along the Cincinnati Arch to more than 450 ft in southeasternmost Kentucky. Regional structural dip is to the southeast, toward the central Appalachian Basin (MacQuown and Pear, 1983).

Hydrocarbon reservoirs in the Big Lime of Kentucky occur in two general lithofacies: oolitic lime grainstones and dolomitic limestones to dolostones (Webb, 1972; Birch, 1983; MacQuown and Pear, 1983; Nicholson, 1983; Frankie, 1990; Smosna, 1996). Dolostone reservoirs are primarily restricted to the basal Big Lime, and occur in broad, discontinuous, linear zones that overlie thin areas in the underlying Borden clastics. This basal zone may represent filling of channels cut into the Borden before the Big Lime was deposited, filling of relict depositional topography on the top of the Borden, or syndepositional faulting (Tebo and others, 1994). Oolitic reservoirs can occur anywhere within the interval and were deposited in shoals or tidal channels (MacQuown and Pear, 1983).

## METHODOLOGY

These cross sections were generated by computer using 155 digitized geophysical logs. Wells included in the sections were chosen on the basis of location, presence of Big Lime hydrocarbon production, depth of penetration, and log availability. All wells extend to the top of the Devonian Ohio (Chattanooga) Shale, and typically have gamma-ray and formation-density logs available. We tried to include wells in major Big Lime oil or gas fields where possible. A complete list of wells used in the cross sections, sorted by county, is included in Appendix A.

Well logs are plotted at a vertical scale of 1 in. equals 400 ft for structural sections and 1 in. equals 200 ft for stratigraphic sections. Logs are spaced proportionately between edges at a horizontal scale of 1 in. equals 8 mi. This scaling results in a vertical exaggeration of 422:1 for the structural sections and 211:1 for the stratigraphic sections. Stratigraphic correlations are illus-

trated using lithologic patterns, which are explained in the "Key to Horizons" included on each section. A location map is provided on each section, and the location of the current line is highlighted in green. Figure 1 shows the locations of all the sections.

Each stratigraphic section uses the top of the Big Lime as a datum. Logs were aligned on this horizon to discount post-depositional structural movement, permitting easier interpretation of stratigraphic variations. Each structural section uses a sea-level datum, and logs are adjusted to their present-day structural positions. This allows interpretation of the regional structure of these rocks. The approximate locations of mapped surface faults are indicated along the bottom of the structural sections. There may be other unmapped surface faults or subsurface faulting between the wells on these sections, particularly in areas with steep dip between wells. Data were not available on the location or throw of subsurface faults in the study area. Major structural features are also labeled on the structural sections.

## BIG LIME CORRELATIONS

Much of the hydrocarbon production from the Big Lime interval is stratigraphically controlled. Because of this, the internal stratigraphy and facies relationships in the Big Lime are key factors in exploration. We attempted to correlate subzones within the Big Lime interval where possible. Previous workers (Birch, 1980; Pear, 1980; Hetherington, 1981) correlated subzones within the Big Lime in much smaller areas. We attempted to extend their work to the downdip areas in eastern Kentucky. Four subzones were defined within the Big Lime on the basis of persistent, thin, shale marker beds (high gamma-ray markers), and correlated within the sections. In updip areas (to the northwest), the Big Lime section becomes thinner and has a more massive gamma-ray signature. As a result, subzone correlations could not be extended into updip areas with confidence, and they are not carried completely across the dip sections. In general, we found the subzone correlations to be difficult to make, and of questionable validity in some areas. They should be used as a general guide, and refined by additional correlation in areas of specific interest. The subzone log response was not calibrated by description of cuttings or core. Gamma-ray correlations within the Big Lime are complicated by the presence of radioactive carbonates, which produce high gamma-ray signatures, similar to a shale response. The radioactive mineral is not known, but the gamma-ray response appears to be caused by uranium, as indicated on the few spectral gamma-ray logs available. We avoided picking radioactive carbonates as zone boundaries, but cau-

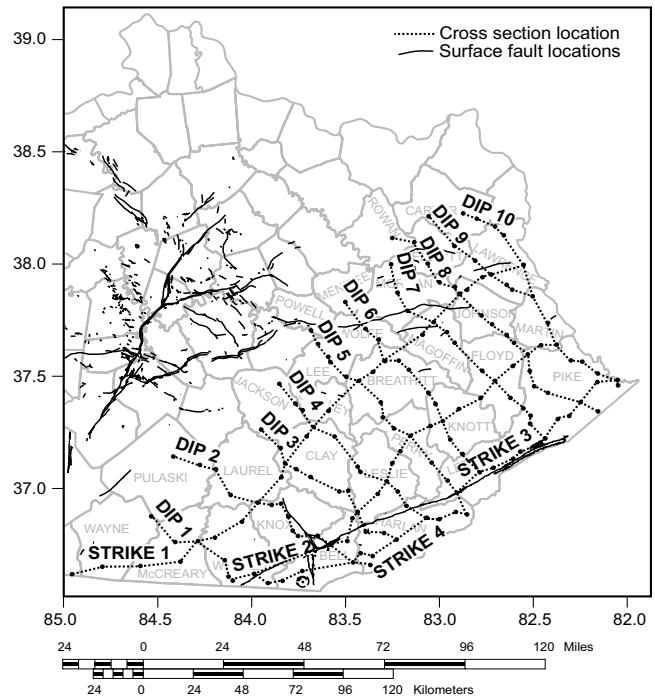


Figure 1. Locations of the 14 cross sections.

tion should be used in extending this work into other areas.

The subzone correlations may relate to sequence stratigraphic interpretations made by Al-Tawil (1994a, b, 1998) for the Mississippian interval in the Appalachian Basin, but the exact relationship has not been determined. Al-Tawil integrated outcrop interpretations with subsurface well log data, but did not have access to the data from this study.

These cross sections illustrate the regional southeastern dip of Mississippian rocks into the Appalachian Basin. Major structures shown on the sections include the Paint Creek Uplift, the Rockcastle River Uplift, and the Pine Mountain thrust sheet. The Big Lime reaches a maximum thickness of 427 ft in Pike County, and 482 ft on the thrust sheet in Bell County, southeast of the Pine Mountain Fault. Thickness variations of individual subzones within the Big Lime have not been studied in detail. In some areas, the Big Lime shows reciprocal thickness relationships with the underlying Borden Group, thickening over Borden thins. This is thought to have been caused by the filling of erosional topography on the Borden surface (MacQuown and Pear, 1983; Conrad and others, 1994; Moshier and Stamper, 1994; Tebo and others, 1994).



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APPENDIX A. COUNTY LISTING OF WELLS USED IN REGIONAL CROSS SECTIONS

APINO	OPERATOR	WELL NUMBER	FARM NAME	CO	CARTER COORDINATES	ELEV	TOTAL DEPTH	TD FM	RESULT	DATE	QUANT	UNIT	PAY
COUNTY = BELL													
1601379511	THE WISER OIL	7	THACKER COAL.	BLL	2820FSL0825FEL20 B67	01919	03564	341HURNL	D&A	5/04/90			
1601334477	WEAVER OIL & G	1	J M HUBER CORP	BLL	1800FSL2000FWL11 B68	02010	04100	357CLNT	D&A	5/01/79			
1601330992	WEAVER OIL & G	34211	KENTUCKY WEST	BLL	0000FSL0950FEL25 C70	02046	04313	350SLRN	GAS	9/09/76		MCFGPD	332BIGL
1601383838	THE WISER OIL	2	BIG JIM COAL C	BLL	2735FNL2360FEL05 D71	01159	02953	357CLNT	D&A	5/26/93			
1601338282	ARCO EXPL DIV	1	BROC, LEE ROY	BLL	1700FSL2150FWL11 D71	01140	03383	357CLNT	D&A	7/17/80			
NUMBER OF WELLS LISTED IN BELL COUNTY = 5													
COUNTY = BREATHITT													
1602578028	EQUITABLE RESO	KP1149	EQUITABLE RESO	BRT	1060FNL1380FEL21 L74	01209	02802	357CLNT	D&A	12/05/89			
1602545047	PANBOWL PRODUC	GA1	JETT, MORT SR	BRT	1560FSL0250FEL13 M72	00738	01586	357CLNT	D&A	9/30/81			
1602536655	JUSTICE, PAUL	1474A	GABBARD, ROY	BRT	2420FSL0290FEL18 M73	01024	01926	344CORN	D&A	1/21/80			
1602548752	PANBOWL PRODUC	1	BREWER, SELDON	BRT	0900FNL1200FEL07 M74	00780	01820	355BGSX	GAS	5/13/82	00100	MCFGPD	332BIGL
1602530955	CNG PRODUCING	AA3	JOSEPH, VIRGIN	BRT	1750FNL1700FWL02 M76	00885	02548	357CLNT	D&A	7/26/76			
1602534036	HOLBROOK, LEON	2	HOLBROOK, LEON	BRT	0200FSL1095FWL15 N75	00803	01915	357CLNT	DG	1/17/79	00094	MCFGPD	355BGSX
1602532549	CNG PRODUCING	AA16	STEVENS, CLAUD	BRT	0350FNL0150FWL16 N76	00842	01928	344CORN	GAS	4/03/78	00037	MCFGPD	340BBSI
NUMBER OF WELLS LISTED IN BREATHITT COUNTY = 7													
COUNTY = CARTER													
1604369711	SUE L CRAIN CO	1	LOWE, EVELYN	CRR	0170FSL1840FEL19 V77	00961	01607	357CBOC	OIL	8/20/85	00001	BOPD	344CORN
1604374089	IRC/COMGAS, IN	4	GENERAL REFRAC	CRR	1100FNL2000FWL16 V80	00608	01456	341OHIO	GAS	5/05/87		MCFGPD	341HURNL
1604336361	INLAND GAS CO,	580	HOLBROOK, JAME	CRR	2950FSL1240FWL21 V80	00681	01540	341OHIO	D&A	3/13/80			
NUMBER OF WELLS LISTED IN CARTER COUNTY = 3													
COUNTY = CLAY													
1605170713	PENN-VIRGINIA	1003	FORDSON COAL C	CLY	2800FNL1150FWL18 G72	01006	05707	368RSRN	GAS	1/08/86		MCFGPD	332BIGL
1605169631	RAMCO OIL & GA	1	WHITE, JAMES	CLY	2310FNL1405FWL10 H68	01018	01373	341NALB	GAS	8/21/85	00311	MCFGPD	332BIGL
1605170445	RAMCO OIL & GA	1	BARNARD, WILLI	CLY	0015FSL0495FWL22 H68	01197	01746	341NALB	GAS	10/05/85	00060	MCFGPD	332BIGL
1605169637	RAMCO OIL & GA	1	SWAFFORD, ISAB	CLY	1625FSL0775FEL13 H69	00889	01602	357CLNT	GAS	8/19/85		MCFGPD	300PLZC
1605152053	RAMCO OIL & GA	1	BOWLING, NANCY	CLY	0740FSL1850FEL23 H70	00946	02070	357CBOC	GAS	11/29/82	00023	MCFGPD	332BIGL
1605174579	KENNCO GAS, IN	1	FIELDS, ROY	CLY	1810FNL2360FEL13 I68	01036	03355	368KNOX	GAS	6/09/87	00300	MCFGPD	368KNOX
1605154583	PERKINSON PETR	1	BARRETT, CONLE	CLY	2790FNL0100FEL08 J70	01050	04000	368KNOX	GAS	7/11/83	00085	MCFGPD	344CORN
1605167899	APPALACHIAN OI	1	SAWYERS, RUBEN	CLY	0510FSL0690FEL16 J70	00978	03817	368BKMN	GAS	4/30/85		MCFGPD	332BIGL
1605179453	HUNTINGTON ENE	6	FLINN HEIRS	CLY	1500FSL0220FEL20 J71	00929	01965	357CLNT	GAS	5/02/90		MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN CLAY COUNTY = 9													
COUNTY = ELLIOTT													
1606339081	TERRA OIL & GA	1	BURKE, EVERETT	ELT	0800FSL2000FEL09 S77	00738	01025	341OHIO	O&G	12/02/80		BOPD	337WEIR
1606339048	ELLIOTT COUNTY	1	BROWN, OPAL	ELT	0500FNL1200FEL09 T76	01001	01300	344CORN	D&A	9/08/80			
1606323542	MONITOR PETROL	1	ISON, CECIL	ELT	0745FSL1665FWL08 T79	00676	09665	375BASL	O&G	7/19/70		MCFGPD	365STPR
NUMBER OF WELLS LISTED IN ELLIOTT COUNTY = 3													
COUNTY = FLOYD													
1607141800	KEPCO, INC	KL315	MARTIN, HELEN	FLD	2450FSL0100FEL14 L81	01008	02906	344CORN	GAS	8/04/81	00133	MCFGPD	341OHIO
1607177727	EASTERN KENTUC	KF1099	E K P C (NIMRO	FLD	1775FNL2325FEL14 L83	01461	03793	341RNST	GAS	4/07/89		MCFGPD	341OHIO
1607177070	EASTERN KENTUC	KL-986	E K P C (FLANN	FLD	2235FNL0190FWL03 M81	00921	02622	341OLNG	GAS	1/24/89		MCFGPD	341CLVD
1607176809	EASTERN KENTUC	KF930	E K P C	FLD	0460FSL1625FWL14 M82	01073	03057	341RNST	GAS	12/08/88		MCFGPD	332BIGL
1607151197	SOUTHEASTERN G	D91	HATCHER, JAMES	FLD	0650FSL0300FEL17 N83	01237	03210	341OHIO	GAS	9/13/82	00211	MCFGPD	341OHIO
1607179685	C D & G ENT-GA	CB1	LAFFERTY, SAMM	FLD	0550FSL1370FWL13 O83	00874	02886	341OLNG	GAS	5/30/90		MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN FLOYD COUNTY = 6													
COUNTY = HARLAN													
1609577072	EQUITABLE RESO	KL1020	KY & W VA COAL	HRL	2090FNL0280FEL14 C73	01820	04624	357CLNT	GAS	11/22/88	00211	MCFGPD	341CHAT
1609577863	CUMBERLAND HAR	5	CHAMPION INTER	HRL	3665FSL4689FEL02 C74	01665	04818	355LCKP	GAS	4/08/90	00020	MCFGPD	332BIGL
1609577772	CUMBERLAND HAR	1	CROUSHORN, JAM	HRL	4110FNL1800FEL13 C74	01573	04910	357CLNT	GAS	3/11/89		MCFGPD	341HURNL
1609578352	CUMBERLAND HAR	1	SAYLOR, PEARL	HRL	3290FNL14050FWL10 D72	01223	03720	357CLNT	GAS	7/12/89		MCFGPD	332BIGL
1609578622	CUMBERLAND HAR	6	CHAMPION INTER	HRL	1800FSL1475FWL21 D73	02013	04984	357CLNT	GAS	5/10/90		MCFGPD	332BIGL
1609577108	PENN-VIRGINIA	8843	HALL LAND & MI	HRL	1000FSL0480FEL05 D76	02049	05425	357CLNT	GAS	1/11/89		MCFGPD	341CHAT
1609576942	PENN-VIRGINIA	8832	BLANTON, BAILE	HRL	0120FNL1020FEL25 E74	01244	03994	344CORN	GAS	9/20/88	00440	MCFGPD	341CHAT
1609579590	CUMBERLAND HAR	1FEE	CUMBERLAND HAR	HRL	0850FNL1250FEL24 E75	01615	04490	341CHAT	GAS	4/29/90	00010	MCFGPD	341CHAT
1609581310	ARK LAND CO	E3	ARK LAND CO	HRL	1590FNL0680FEL02 E78	03597	07095	344CORN	GAS	1/07/92	00929	MCFGPD	332BIGL
1609579755	THE WISER OIL	1	BANK OF HARLAN	HRL	0665FNL0230FWL05 E78	01548	05058	344CORN	D&A	6/05/90			
1609529757	RAY RESOURCES,	153	GEORGIA PACIFI	HRL	1900FSL2750FWL09 F76	01641	05319	365TRNT	D&A	10/29/75			
1609581041	ARK LAND CO	E1	ARK LAND CO	HRL	1000FNL0850FEL20 F79	02695	06747	357RHLL	GAS	1/14/91	00188	MCFGPD	337WEIR
1609572463	A N R PRODUCTI	KY1	PENN VIRGINIA	HRL	1050FSL0150FEL18 F80	02985	06365	344CORN	GAS	6/30/86		MCFGPD	337WEIR

## Appendix A

APINO	OPERATOR	WELL NUMBER	FARM NAME	CO	CARTER COORDINATES	ELEV	TOTAL DEPTH	TD FM	RESULT	DATE	QUANT	UNIT	PAY
COUNTY = ELLIOTT													
1606339081	TERRA OIL & GA	1	BURKE, EVERETT	ELT	0800FSL2000FEL09 S77	00738	01025	341OHIO	O&G	12/02/80		BOPD	337WEIR
1606339048	ELLIOTT COUNTY	1	BROWN, OPAL	ELT	0500FNL1200FEL09 T76	01001	01300	344CORN	D&A	9/08/80			
1606323542	MONITOR PETROL	1	ISON, CECIL	ELT	0745FSL1665FWL08 T79	00676	09665	375BASL	O&G	7/19/70		MCFGPD	365STPR
NUMBER OF WELLS LISTED IN ELLIOTT COUNTY = 3													
COUNTY = FLOYD													
1607141800	KEPCO, INC	KL315	MARTIN, HELEN	FLD	2450FSL0100FEL14 L81	01008	02906	344CORN	GAS	8/04/81	00133	MCFGPD	341OHIO
1607177727	EASTERN KENTUC	KF1099	E K P C (NIMRO	FLD	1775FNL2325FEL14 L83	01461	03793	341RNST	GAS	4/07/89		MCFGPD	341OHIO
1607177070	EASTERN KENTUC	KL-986	E K P C (FLANN	FLD	2235FNL0190FWL03 M81	00921	02622	341OLNG	GAS	1/24/89		MCFGPD	341CLVD
1607176809	EASTERN KENTUC	KF930	E K P C	FLD	0460FSL1625FWL14 M82	01073	03057	341RNST	GAS	12/08/88		MCFGPD	332BIGL
1607151197	SOUTHEASTERN G	D91	HATCHER, JAMES	FLD	0650FSL0300FEL17 N83	01237	03210	341OHIO	GAS	9/13/82	00211	MCFGPD	341OHIO
1607179685	C D & G ENT-GA	CB1	LAFFERTY, SAMM	FLD	0550FSL1370FWL13 O83	00874	02886	341OLNG	GAS	5/30/90		MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN FLOYD COUNTY = 6													
COUNTY = HARLAN													
1609577072	EQUITABLE RESO	KL1020	KY & W VA COAL	HRL	2090FNL0280FEL14 C73	01820	04624	357CLNT	GAS	11/22/88	00211	MCFGPD	341CHAT
1609577863	CUMBERLAND HAR	5	CHAMPION INTER	HRL	3665FSL4689FEL02 C74	01665	04818	355LCKP	GAS	4/08/90	00020	MCFGPD	332BIGL
1609577772	CUMBERLAND HAR	1	CROUSHORN, JAM	HRL	4110FNL1800FEL13 C74	01573	04910	357CLNT	GAS	3/11/89		MCFGPD	341HURNL
1609578352	CUMBERLAND HAR	1	SAYLOR, PEARL	HRL	3290FNL4050FWL10 D72	01223	03720	357CLNT	GAS	7/12/89		MCFGPD	332BIGL
1609578622	CUMBERLAND HAR	6	CHAMPION INTER	HRL	1800FSL1475FWL21 D73	02013	04984	357CLNT	GAS	5/10/90		MCFGPD	332BIGL
1609577108	PENN-VIRGINIA	8843	HALL LAND & MI	HRL	1000FSL0480FEL05 D76	02049	05425	357CLNT	GAS	1/11/89		MCFGPD	341CHAT
1609576942	PENN-VIRGINIA	8832	BLANTON, BAILE	HRL	0120FNL1020FEL25 E74	01244	03994	344CORN	GAS	9/20/88	00440	MCFGPD	341CHAT
1609579590	CUMBERLAND HAR	1FEE	CUMBERLAND HAR	HRL	0850FNL1250FEL24 E75	01615	04490	341CHAT	GAS	4/29/90	00010	MCFGPD	341CHAT
1609581310	ARK LAND CO	E3	ARK LAND CO	HRL	1590FNL0680FEL02 E78	03597	07095	344CORN	GAS	1/07/92	00929	MCFGPD	332BIGL
1609579755	THE WISER OIL	1	BANK OF HARLAN	HRL	0665FNL0230FWL05 E78	01548	05058	344CORN	D&A	6/05/90			
1609529757	RAY RESOURCES,	153	GEORGIA PACIFI	HRL	1900FSL2750FWL09 F76	01641	05319	365TRNT	D&A	10/29/75			
1609581041	ARK LAND CO	E1	ARK LAND CO	HRL	1000FNL0850FEL20 F79	02695	06747	357RHLL	GAS	11/4/91	00188	MCFGPD	337WEIR
1609572463	A N R PRODUCTI	KY1	PENN VIRGINIA	HRL	1050FSL0150FEL18 F80	02985	06365	344CORN	GAS	6/30/86		MCFGPD	337WEIR
NUMBER OF WELLS LISTED IN HARLAN COUNTY = 13													
COUNTY = JACKSON													
1610972514	TESTCO DRILLIN	1	MOORE, CARSON	JCK	1950FNL0600FWL14 J67	01177	01431	344CORN	D&A	5/21/86			
1610949252	REXPLORE, INC	1	FARMER, CLAREN	JCK	0250FNL2200FEL04 L68	01240	01244	357CLNT	D&A	5/20/82			
NUMBER OF WELLS LISTED IN JACKSON COUNTY = 2													
COUNTY = JOHNSON													
1611539121	ARCO EXPL DIV	1	KENTUCKY WEST	JNS	2240FNL1595FEL01 O82	00686	10951	400PCMB	D&A	12/10/80			
1611579345	GLOBAL DEV & E	4	BLEVINS, CLYDE	JNS	3020FNL2735FEL04 P81	00722	02734	357CLNT	GAS	4/11/90		MCFGPD	340BBSI
1611534554	KENTUCKY WEST	7314	DOLLARHIDE, W	JNS	0775FSL0500FEL11 P81	00717	06412	368RSRN	D&A	7/18/79			
1611581360	ASHLAND EXPLOR	1-R	HAMILTON, ELLI	JNS	0025FSL1910FWL13 R79	01019	02280	357RHLL	GAS	11/13/91		MCFGPD	344CORN
1611540821	BUFFALO RESOUR	1	WILLIAMS, KEND	JNS	1150FSL1300FWL21 R79	00835	02208	357CLNT	GAS	2/06/81		MCFGPD	344CORN
1611565387	BUFFALO RESOUR	2	JAYNE, ERNEST	JNS	3550FNL2850FEL17 R80	00991	02406	357RHLL	GAS	12/17/84		MCFGPD	344CORN
NUMBER OF WELLS LISTED IN JOHNSON COUNTY = 6													
COUNTY = KNOTT													
1611978624	ASHLAND EXPLOR	26	EASTERN KENTUC	KNT	1450FNL0075FEL05 J78	01410	03280	344CORN	GAS	9/10/90		MCFGPD	341OHIO
1611980155	BRADLEY, C R D	3	MULLINS, MATTI	KNT	1138FSL0899FWL18 J79	01235	03241	341OHIO	GAS	11/09/90		MCFGPD	332BIGL
1611961545	ASHLAND EXPLOR	1	EASTERN KY REA	KNT	0440FSL1900FEL20 K78	01637	03397	344CORN	GAS	1/14/85	02460	MCFGPD	332BIGL
1611951959	SOUTHEASTERN G	E38	TRIPLETT, J L	KNT	1450FSL0475FEL01 K79	01562	03250	341OHIO	D&A	10/24/83			
1611976347	ASHLAND EXPLOR	22	EASTERN KENTUC	KNT	2420FNL0690FEL10 L77	01330	03230	357RHLL	GAS	7/19/88		MCFGPD	341OHIO
1611938106	KEPCO, INC	K4	ARIO CORP	KNT	1125FNL1425FWL23 L78	01285	02952	344CORN	GAS	9/30/80		MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN KNOTT COUNTY = 6													
COUNTY = KNOX													
1612142720	KEYSER, AL J	1	GRAY, CAMMIE	KNX	1552FSL0790FWL01 D69	01235	02500	357CLNT	GAS	6/03/81		MCFGPD	341CHAT
1612179689	G & M OIL CO	1	GARLAND, JERRY	KNX	2775FSL0650FEL05 E69	01045	04740	368KNOX	GAS	5/14/90	00012	MCFGPD	341CHAT
1612139273	KEYSER, AL J	1	ARENA, ANNETTE	KNX	3975FSL1870FWL23 E69	01140	02505	357CLNT	GAS	12/11/80		MCFGPD	332BIGL
1612181370	SIGNAL RESERVE	1	SEARS, JACK	KNX	0840FNL0001FWL14 F67	01204	01932	341CHAT	GAS	3/02/91	00301	MCFGPD	332BIGL
1612181470	ANDERSON, BRUC	1	GAMBREL UNIT	KNX	0450FNL1900FWL12 F68	01085	04562	368KNOX	GAS	11/04/91	00026	MCFGPD	368KNOX
1612128988	THE WISER OIL	1	SMITH, BOYD CO	KNX	3000FNL1430FWL15 F68	01115	01858	341CHAT	GAS	9/30/75		MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN KNOX COUNTY = 6													
COUNTY = LAUREL													
1612577309	V M & M MINING	2	CAUSEY, ARTHUR	LRL	2330FNL0350FWL03 F65	01164	03969	368KNOX	GAS	11/15/88		MCFGPD	332BIGL
1612514996	ALGONQUIN PETR	1	ROGERS, JAMES	LRL	2800FNL0400FEL17 H64	01184	03530	368KNOX	D&A	10/27/65			
NUMBER OF WELLS LISTED IN LAUREL COUNTY = 2													

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APINO	OPERATOR	WELL NUMBER	FARM NAME	CO	CARTER COORDINATES	ELEV	TOTAL DEPTH	TD FM	RESULT	DATE	QUANT	UNIT	PAY
COUNTY = LAWRENCE													
1612783906	MET GAS CO, A	4	METGASCO	LR	0110FNL2450FEL04 R81	00865	01234	341OHIO	GAS	9/09/93	00095	MCFGPD	339BREA
1612776994	EASTERN AMERIC	2	BRYANT, ERNEST	LR	1300FNL1710FEL11 R82	00795	02399	341OHIO	GAS	9/25/88	00060	MCFGPD	339BREA
1612777462	MOUNTAIN ENER	1	VANHOOSE, HARO	LR	1250FNL0650FWL17 R83	00592	01620	341OHIO	GAS	12/16/88	00150	MCFGPD	339BREA
1612754341	DORAN & ASSOCI	DD-1	SPARKS, W D ET	LR	2300FSL0120FWL01 S80	00730	01392	341OHIO	O&G	3/13/83	00002	BOPD	339BREA
1612730100	WEAVER OIL & G	1	HAYES-DAUGIRDA	LR	2490FNL1275FWL21 S81	00976	03281	357BRSF	GAS	1/16/76	00111	MCFGPD	339BREA
1612724893	COLUMBIA GAS T	9557T	FIEGER, THOMAS	LR	1300FSL0560FEL10 S83	00799	04037	357CLNT	D&A	9/23/71			
1612724502	INLAND GAS CO,	542	YOUNG, W P & R	LR	2475FNL1550FWL06 U82	00865	12712	400PCMB	D&A	5/13/71			
1612778437	COLUMBIA NATUR	1	STUART, BENNY	LR	1175FSL0650FWL19 U82	00602	06105	368BKMN	O&G	10/03/89	00004	BOPD	339BREA
NUMBER OF WELLS LISTED IN LAWRENCE COUNTY = 8													
COUNTY = LEE													
1612961724	RAVENNA OIL CO	1P	WHISMAN, JOE	LEE	2600FSL0540FEL14 N71	01020	01433	357RHLL	OIL	5/12/84	00001	BOPD	344CORN
1612950691	REXPLORE, INC	1	JEWELL, HERBER	LEE	0790FSL0250FWL19 N71	00965	01460	344CORN	D&A	10/21/82			
1612944827	ASHLAND EXPLOR	378	EUREKA (PREWIT	LEE	1186FNL2259FEL22 O70	01034	01116	344CORN	OIL	9/18/81		BOPD	344CORN2
NUMBER OF WELLS LISTED IN LEE COUNTY = 3													
COUNTY = LESLIE													
1613144431	CABOT OIL & GA	4	SOUTH MISSISSI	LSL	2400FNL2400FWL04 E73	01700	04050	344CORN	GAS	9/13/81		MCFGPD	332BIGL
1613183768	EQUITABLE RESO	KP2065	HUBER, J M COR	LSL	1060FSL0350FWL19 F73	01281	03329	341OHIO	D&A	9/16/92			
1613145455	PETROLEUM CORP	37	FORDSON COAL C	LSL	1950FNL2175FWL20 G72	01104	03026	357CLNT	GAS	11/12/81		MCFGPD	344CORN
1613163510	RILEY KENTUCKY	KR10	KENTUCKY RIVER	LSL	0925FSL0950FWL20 G74	01635	03984	344CORN	GAS	8/03/84		MCFGPD	332BIGL
1613171937	EASTERN KENTUC	KP642	LEWIS, RAY C	LSL	2350FNL0975FWL03 G75	01473	03704	344CORN	GAS	6/16/86	01100	MCFGPD	332BIGL
1613134147	KEPCO, INC	7300	YATES, A H	LSL	0400FSL1925FEL15 G76	01680	04034	344CORN	O&G	10/15/79	00004	BOPD	332BIGL
1613144478	PETROLEUM CORP	2	ASHKOR COAL & L	LSL	1830FSL0900FEL08 H73	01234	02999	344CORN	GAS	12/05/81	00100	MCFGPD	332BIGL
1613140676	PETROLEUM CORP	35	FORDSON COAL C	LSL	1150FNL2350FWL19 H73	01263	03058	344CORN	GAS	9/20/81	00100	MCFGPD	332BIGL
1613146533	KEPCO, INC	1760	KYCOGA LAND CO	LSL	2200FSL1550FEL02 H75	01301	03341	344CORN	GAS	5/31/82	05180	MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN LESLIE COUNTY = 9													
COUNTY = LETCHER													
1613369617	TALBOTT, J SCO	T46	DEPUE, JUNE	LCR	0300FSL1100FEL11 G79	01508	04230	341OHIO	GAS	8/07/85		MCFGPD	332BIGL
1613360847	KEPCO, INC	KE558	ISON, JESSE T	LCR	0950FSL1700FEL24 H79	01510	04106	344CORN	GAS	6/06/84	00054	MCFGPD	341OHIO
1613380677	EQUITABLE RESO	KF1676	EREX (COMBS, E	LCR	2250FNL0750FEL14 H81	01534	03625	341OHIO	GAS	12/13/90		MCFGPD	332BIGL
1613342008	KEPCO, INC	KL351	ELKHORN COAL C	LCR	1350FNL300FWL07 H82	01640	04436	341OHIO	O&G	5/22/81	00025	BOPD	332BIGL
1613360977	KEPCO, INC	KL395	WOLFE, T B ET	LCR	1575FSL0800FWL14 R80	01818	04154	344CORN	GAS	6/05/84	00056	MCFGPD	332BIGL
1613380513	EQUITABLE RESO	KF1743	EREX (POTTER,	LCR	2890FSL1380FEL18 R83	01689	04646	341OHIO	GAS	2/15/91		MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN LETCHER COUNTY = 6													
COUNTY = MAGOFFIN													
1615333225	WEAVER OIL & G	1	KY W VA GAS CO	MGF	0950FSL1050FWL03 O77	00842	02182	357CLNT	D&A	5/14/78			
1615327278	SAN JUAN OIL C	1	KENTUCKY WEST	MGF	0750FSL0520FEL13 O79	00834	02450	357CLNT	GAS	12/01/73			
1615330954	CNG PRODUCING	AA2	HOWARD, FRED	MGF	2400FNL0900FEL15 P78	00990	02697	355BGXS	GAS	7/17/76	00060	MCFGPD	355BGXS
1615376501	AEI-KAARS DRIL	7	COLLINSWORTH,	MGF	0200FSL0830FWL25 P79	01010	01259	341OHIO	SRI	5/31/88		INJECT	337WEIR
1615351850	JIMMY HAMILTON	309	GULLETT, LEE &	MGF	1510FSL0120FWL16 Q79	00906	03999	365HGBG	GAS	10/17/82	01300	MCFGPD	365HGBG
NUMBER OF WELLS LISTED IN MAGOFFIN COUNTY = 5													
COUNTY = MARTIN													
1615984972	PENN-VIRGINIA	8910	POCAHONTAS DEV	MAR	0110FSL0075FWL14 O85	00976	03436	341OHIO	GAS	8/24/93	00084	MCFGPD	332BIGL
1615970434	GILBERT IMPORT	1	PREECE, EMMA H	MAR	1580FNL0240FWL12 P85	00820	03283	344CORN	GAS	11/01/85		MCFGPD	337INJN
1615943678	ASHLAND EXPLOR	3	KIRK, ARTHUR	MAR	0360FNL0340FWL02 Q84	00914	02885	341OHIO	GAS	9/02/81	00151	MCFGPD	341OHIO
NUMBER OF WELLS LISTED IN MARTIN COUNTY = 3													
COUNTY = MCCREARY													
1614749185	WESTERN RESERV	4	STEARNS COAL &	MCR	0700FNL0175FEL02 B59	00910	00815	341CHAT	OIL	11/09/82		BOPD	332BIGL
1614769369	HUGHES TEXAS P	1	CAMPBELL, D H	MCR	3000FSL1620FEL17 C62	01358	02049	344CORN	D&A	7/25/85			
1614730374	DIXIE OIL & GA	1	OWENS, DUANE E	MCR	2550FNL1700FWL20 D61	00959	02000	365STRV	D&A	4/30/76			
NUMBER OF WELLS LISTED IN MCCREARY COUNTY = 3													
COUNTY = MENIFEE													
1616529846	MONITOR PETROL	1	CAMPBELL, ALEX	MNF	2500FSL0400FEL14 Q72	01118	06787	400PCMB	D&A	12/10/74			
NUMBER OF WELLS LISTED IN MENIFEE COUNTY = 1													
COUNTY = MORGAN													
1617541761	TEXAS INTERNAT	1	CARPENTER, LUT	MRG	2400FSL2150FWL23 Q76	00815	02701	357CLNTS	GAS	2/16/81		MCFGPD	341OHIO
1617558705	PELFREY, ROBER	1	WALTERS, RALPH	MRG	1580FSL0520FEL22 R75	00890	01783	357CLNT	D&A	11/05/83			
1617551605	ASHLAND EXPLOR	1	BROWN, LENA	MRG	0880FSL1890FWL08 R78	00825	05045	372CPRG	D&A	10/07/82			
1617521871	ASHLAND OIL &	1	LEE CLAY PRODU	MRG	2030FNL1900FEL14 S75	00778	05757	400PCMB	D&A	2/21/69			
NUMBER OF WELLS LISTED IN MORGAN COUNTY = 4													

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APINO	OPERATOR	WELL NUMBER	FARM NAME	CO	CARTER COORDINATES	ELEV	TOTAL DEPTH	TD FM	RESULT	DATE	QUANT	UNIT	PAY
COUNTY = OWSLEY													
1618984662	MIDAMCO, INC	1	MCWHORTER, DEW	OSL	1375FNL0525FEL04 K69	01002	03754	368KNOX	GAS	7/03/93	00010	MCFGPD	332BIGL
1618966544	OHIO-KENTUCKY	1	HUDSON, EMERY	OSL	1100FSL0850FEL09 K69	01096	01660	344CORN	D&A	1/26/85			
1618965233	OHIO-KENTUCKY	1	GABBARD, I H H	OSL	1600FSL2300FEL08 K71	00837	02306	344CORN	D&A	10/16/84			
NUMBER OF WELLS LISTED IN OWSLEY COUNTY = 3													
COUNTY = PERRY													
1619380885	EQUITABLE RESO	KF1725	EREX (ELJAH S	PRR	0380FNL2160FWL04 H78	01535	03856	341OHIO	GAS	1/11/91	00500	MCFGPD	341OHIO
1619367241	KEPCO, INC	KL605	ECCO MINING CO	PRR	0925FNL1025FWL14 I76	01249	03248	344CORN	O&G	5/17/85	00020	BOPD	332BIGL
1619376574	EQUITABLE RESO	KF901	EREX (JAMES EV	PRR	5590FSL0001FWL10 J75	01082	03109	357CLNT	D&A	3/01/89			
1619377124	EASTERN KENTUC	KF1001	E K P C (FELTN	PRR	0450FSL1250FWL11 J76	01024	02966	344CORN	GAS	5/04/89	00058	MCFGPD	332BIGL
1619344492	ARCO EXPL DIV	1	DUFF, J C ETAL	PRR	0350FNL2220FEL16 K75	01209	09659	400PCMB	D&A	11/15/81			
NUMBER OF WELLS LISTED IN PERRY COUNTY = 5													
COUNTY = PIKE													
1619542510	KEPCO, INC	KL366	LUCAS, NOAH ET	PIK	1025FSL0400FWL06 I84	01930	04701	341OHIO	O&G	12/19/81	00045	MCFGPD	332BIGL
1619577774	KINZER, J W	B6	WOLFPIT OIL &	PIK	0600FNL0900FEL18 J85	01720	04936	341OHIO	GAS	3/02/89			
1619534404	KENTUCKY WEST	1699	BLAIR FORK COA	PIK	1560FNL2330FWL24 J85	01345	03830	341OHIO	GAS	7/30/79			
1619585227	KINZER, J W	CB199	CLINE, J S ETA	PIK	0350FNL0550FEL05 K84	01215	03738	341OHIO	GAS	9/21/93	00692	MCFGPD	341OHIO
1619579588	C D & G ENT-GA	T1	TACKETT, WICK	PIK	0980FNL0330FWL12 K84	01230	04058	341OHIO	GAS	9/07/90	00200	MCFGPD	341OHIO
1619585034	KINZER, J W	RF-191	PIKE LETCHER L	PIK	0650FNL0850FEL23 K84	01326	04206	344CORN	GAS	9/17/93			
1619578996	ASHLAND EXPLOR	2	REPUBLIC-RATLI	PIK	3000FNL0620FWL13 K86	01373	04545	341OHIO	GAS	3/13/90			
1619584214	ASHLAND EXPLOR	73-R	COLONY COAL &	PIK	0430FNL1580FEL06 K87	01557	04904	341OHIO	GAS	1/25/92			
1619585098	C D & G ENT-GA	GC-1	GREEN, CHARLES	PIK	2528FSL1614FEL01 K88	01325	05258	341OHIO	GAS	10/04/93			
1619579759	C D & G ENT-GA	WF1	GOFF, HUBERT H	PIK	0530FNL2400FWL02 L85	01099	04013	341OHIO	GAS	9/18/90	00180	MCFGPD	341OHIO
1619582314	ASHLAND EXPLOR	D-2	ROWE, G C ET A	PIK	1250FNL1220FWL20 L87	01158	04581	341OHIO	GAS	2/02/92			
1619582189	ASHLAND EXPLOR	12	WEDDINGTON, BA	PIK	0260FNL0860FWL21 M84	01332	03860	341OHIO	GAS	9/02/91	00876	MCFGPD	332BIGL
1619583031	ASHLAND EXPLOR	1	BONZO, EARL D	PIK	2575FNL2200FWL01 M88	01347	05150	344CORN	GAS	9/11/92	00084	MCFGPD	332BIGL
1619584403	COLUMBIA NATUR	22546	CHARLES, J F E	PIK	1575FSL2050FWL11 M88	01178	04676	341OHIO	GAS	5/21/93	00220	MCFGPD	332BIGL
1619584626	KINZER, J W	KC-170	AGEE, ROBERT W	PIK	1625FNL1725FEL15 M90	01009	06034	361DRKS	GAS	5/04/93			
1619584627	KINZER, J W	KC-171	AGEE, ROBERT W	PIK	1900FNL1450FWL17 M90	08000	04970	344CORN	GAS	4/25/93	00474	MCFGPD	340BBSI
1619578522	ROBERTS, OLIVE	1	BLACKBURN-MCCO	PIK	2380FSL0280FEL04 N84	08006	03007	341OLNG	GAS	12/20/89			
1619581844	ASHLAND EXPLOR	B-22	HATCHER, JAMES	PIK	0150FSL2290FWL23 N84	00746	03325	344CORN	GAS	7/08/91	01072	MCFGPD	332BIGL
1619573376	K V OIL & GAS,	PK290	ROUGE STEEL CO	PIK	2050FNL2300FEL11 N87	00950	04359	344CORN	GAS	10/08/86	00185	MCFGPD	332BIGL
1619582480	KINZER, J W	R-3	ROGERS BROTHER	PIK	0300FNL1750FEL15 N87	01167	04286	344CORN	GAS	10/31/91			
1619576744	C D & G ENT-GA	515	STRATTON HEIRS	PIK	0000FSL4400FWL15 O86	00905	03790	344CORN	GAS	7/28/89			
NUMBER OF WELLS LISTED IN PIKE COUNTY = 21													
COUNTY = POWELL													
1619745955	SUN OIL CO	2	ASHLEY, JOHN M	PLL	2336FNL1720FWL04 O70	01104	01096	357CLNT	OIL	12/04/81		BOPD	344CORN
NUMBER OF WELLS LISTED IN POWELL COUNTY = 1													
COUNTY = PULASKI													
1619979838	POTTS, DANIEL	2	BLM-USA TRACT	PLK	2760FNL0090FEL07 E60	01087	02962	368KNOX	GAS	6/30/90		MCFGPD	332BIGL
1619964846	BURTON DRILLIN	6	PHELPS, KENNET	PLK	1990FNL4210FEL02 H61	00870	00800	365SBRK	D&A	9/22/84			
1619976970	OIL FIELD GEOT	1	ARTHUR, GEORGE	PLK	2200FSL0890FEL14 H63	01180	02941	368KNOX	GAS	9/12/88		MCFGPD	333SLWW
NUMBER OF WELLS LISTED IN PULASKI COUNTY = 3													
COUNTY = ROWAN													
1620514647	PENNZOIL CO	1	JONES, CARMIA	RWN	0450FNL3500FWL04 T75	01194	04991	400PCMB	D&A	10/07/65			
NUMBER OF WELLS LISTED IN ROWAN COUNTY = 1													
COUNTY = WAYNE													
1623144250	APPALACHIAN EX	1	HAYES, NANCY	WYN	0030FSL0250FEL14 B55	01746	02926	368KNOX	D&A	8/29/81			
1623137427	SUNRISE PETROL	13	DOBBS, RALPH	WYN	3450FNL0000FEL04 B57	00921	00480	341CHAT	D&A	4/18/80			
NUMBER OF WELLS LISTED IN WAYNE COUNTY = 2													
COUNTY = WHITLEY													
1623584590	A K S ENERGY C	1A	LOVING, KARIS	WTL	1025FSL1650FWL12 B65	00981	02153	357CLNT	GAS	4/12/93	02290	MCFGPD	332BIGL
1623583169	DELTA PRODUCER	1	JARBOE, GEORGE	WTL	1150FNL2200FEL13 B65	01060	02154	357CLNT	GAS	3/24/92	00035	MCFGPD	341CHAT
1623579864	THE WISER OIL	4	STEWART TIMBER	WTL	0150FNL2045FEL06 B67	02032	03512	357CBOC	OIL	7/04/90	00020	BOPD	332MAXN
1623574691	DELTA PET DBA	2	CUMBERLAND COL	WTL	1110FSL0290FEL15 C65	00974	02000	357CLNT	GAS	7/16/87	00024	MCFGPD	332BIGL
1623578307	DELTA PET DBA	4	MOUNTJOY-FAULK	WTL	0290FSL1030FEL14 D63	01094	01602	344CORN	GAS	6/29/89		MCFGPD	332BIGL
1623581247	DAUGHERTY PETR	1	DAVENPORT, JAM	WTL	1700FSL1150FWL08 D64	01105	01730	341CHAT	GAS	2/05/91		MCFGPD	332BIGL
1623580689	SIGNAL RESERVE	1	CRAWFORD, LARR	WTL	1310FNL0700FEL15 E66	01234	01980	341CHAT	GAS	11/30/90	00398	MCFGPD	332BIGL
NUMBER OF WELLS LISTED IN WHITLEY COUNTY = 7													

# Appendix A

APINO	OPERATOR	WELL NUMBER	FARM NAME	CO	CARTER COORDINATES	ELEV	TOTAL DEPTH	TD FM	RESULT	DATE	QUANT	UNIT	PAY
COUNTY = WOLFE													
1623730520	EXXON CORP	1	BANKS, ORVILLE	WLF	3100FSL0350FEL13 O74	01028	12288	400PCMB	D&A	7/15/76			
1623753089	REXPLORE, INC	1	BURTON, JACK &	WLF	2844FNL1894FEL22 P73	01083	01809	357RHLL	D&A	1/25/82			
NUMBER OF WELLS LISTED IN WOLFE COUNTY = 2													
TOTAL WELLS LISTED = 155													